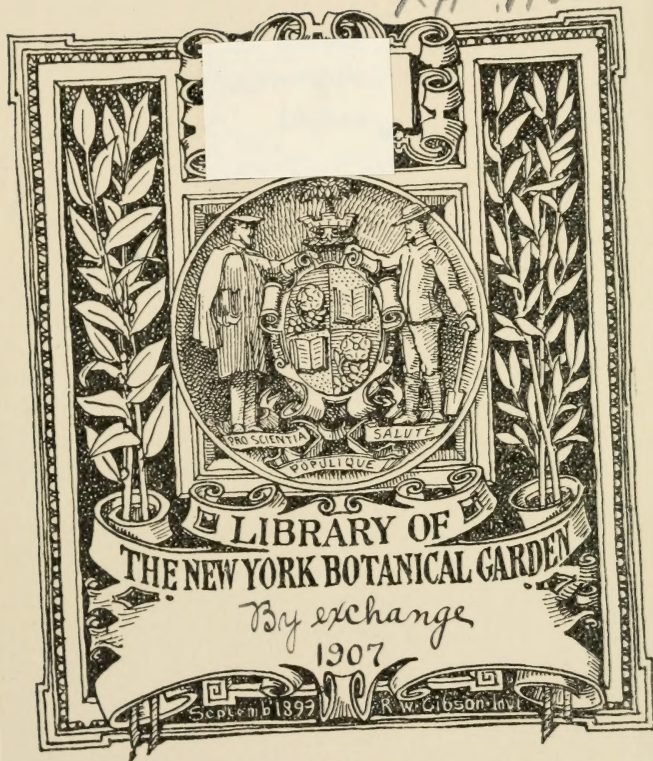


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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

JANUARY, 1906

No. 1

In commencing a new volume, we take pleasure in thanking our contributors for the generous help which they have so readily extended throughout the year. Among so many who have assisted to make the Forester the valuable compendium of Hawaiian Agriculture it has become, we are especially indebted to Mr. Jared Smith, Special Agent in Charge of the Hawaiian Experiment Station; to Mr. Ralph S. Hosmer, Superintendent of Forestry for the Territory, whose advice and assistance has contributed in one form or another to the production of nearly all our numbers; Mr. F. G. Krauss, Agriculturist of the Kamehameha Schools; Mr. D. L. Van Dine, Entomologist, United States Experiment Station, for a timely series of papers on the insects affecting the Tobacco Industry, and to Mr. Jacob Kotinsky, Assistant Entomologist of the Division of Entomology of the Board of Agriculture and Forestry. Among those writers who have contributed more than one article of importance, are Judge Weaver, Mr. Gerrit P. Wilder and Mr. Alexander Craw.

Single papers have been received from Messrs. R. H. Anderson, Nahiku Rubber Co.; Wm. Alanson Bryan, Curator of Ornithology at the Bishop Museum; Byron O. Clark; J. T. Crawley; Henry Davis; F. H. Edwards; John Emmeluth; L. Lewton-Brain, Assistant Director, Division of Pathology, H. S. P. A. Experiment Station; Donald MacIntyre, of Moanalua; P. M. Pond; Alvin Seale, U. S. Fish Commission; J. F. G. Stokes, Curator of Polynesian Ethnology, Bishop Museum; and F. W. Terry, Entomologist, H. S. P. A. Experiment Station. Mr. J. E. Higgins, Secretary of the Farmers' Institute of Hawaii, although not contributing directly, has rendered valuable assistance. To all these gentlemen we extend our hearty thanks and appreciation.

In consequence of the inclusion of official matter in the last Forester, and of the desire to complete Volume II within the year which has just closed, the final article by Mr. Krauss was

unfortunately omitted and is presented in this number. The series of papers presented by the Agriculturist of Kahehameha Schools comprises, in a concise form, a very valuable and trustworthy addition to our scanty local literature on the care of the Vegetable Garden. The difficulties which beset the tiller of the soil in these Islands are, in the case of Gardening, seemingly intensified. With this Department of Agriculture, as indeed with all others in Hawaii, the amount of success attained, directly depends upon the degree of vigilance and labor expended.

The idea of ease and freedom from toil, so often associated by the inexperienced with the tropics, is certainly not realized by the agriculturist in this country. No luxuriant growth and generous harvest attends the "careless scratching of the soil," to which elementary operation the whole system of tropical agriculture has often been reduced in popular literature. The rice fields of Java, the land where nature has been most bountiful in those gifts which would seem to assure a prolific return to agricultural operations, alone bear witness to the tale of bricks which nature exacts from those who would eat of the fruits of the earth. In the Philippine Islands the same constant care is demanded of the husbandman. Nor are the ancient irrigation works scattered throughout our Islands, in some instances still made use of by our sugar plantations, silent as to the labor which was demanded to support the demands of a larger population. A perusal of Mr. Krauss' series of articles will, however, show that few of the problems to be solved are such as will not yield to intelligent efforts. We hope that the writer will be induced to enlarge his articles and embody them in book form.

The artistic window display of Hawaiian grown silk exhibited by Mr. D. L. Van Dine in Messrs. McInerny's Fort street store affords another practical demonstration of the undeveloped resources of the Territory. The Hawaii Experiment Station has during the past year devoted considerable attention to determining the practicability of producing Hawaiian silk, and the exhibit referred to bears testimony of success. As the Forester has often urged, opportunities are not wanting for profitable agricultural enterprise, but the need is of men of sufficient capital, industry and energy to take advantage of our local conditions. We look

forward with interest to the publication of the results of Mr. Van Dine's recent investigations.

Not only do the Australian Colonies give empirical advice through the medium of their excellent official agricultural periodicals, but they are constantly seeking new means to offer individual farmers assistance in the development of the resources of their country. The *Agricultural Gazette of New South Wales* for December, 1905, gives a list of Government Stud Bulls which are available for lease by Agricultural Societies or Dairy Farmers. The list contains four Shorthorn pedigree bulls, four Jersey, seven Guernsey, one Red Poll, two Ayrshire, two Kerry, two Dexter Kerry and one Holstein. The animals are hired out by the Government at a nominal sum for periods of six months under certain prescribed regulations. Other bulls are for service at the various State Farms, where also pure bred pigs are bred and sold. The system has been in operation in New South Wales for some time, and a more practical way of improving the live stock of the country would be difficult to devise.

A Title Page, Table of Contents, List of Authors and Illustrations, and General Index to Volume II accompanies this number.

THE PROFESSION OF FORESTRY.

From an interesting article by President C. W. Eliot, of Harvard University, appearing in *Science*, on Dec. 15, 1905, are copied the following paragraphs as indicative of the fact that forestry is recognized as having a place among the professions.

* * * "The large and strong universities in America are alike in their general purpose to provide good training for all the professions or intellectual occupations. It was two endowed institutions—Harvard and Yale—that started scientific schools almost simultaneously in 1846-7; and this purpose characterizes the great endowed institutions to-day quite as strongly as it does the state universities. To this general proposition there is only

one important exception; the state universities and many of the endowed institutions give no direct training for the ministry. For law, medicine, teaching, engineering of all sorts, mining, agriculture, manufacturing, the mechanic arts, and business, the American universities, so far as they discern the needs of the country, make the amplest provision which their resources permit. Several of them have lately added architecture to the list of their professional subjects. The training of professional musicians in a large sense has been taken up by a few universities. As soon as forestry was recognized as a needed profession in the United States, several universities began to provide instruction in that great subject. It is obviously the purpose of the American institutions of learning to train young men for all intellectual callings, making no distinction among them as regards their dignity and serviceableness. * * *

"It is obvious that the policy of the American universities now under consideration has had, and is going to have, a strong effect to uplift the relatively new professions, like those of engineering, applied chemistry, architecture, music, mining, forestry, the public service, transportation and large scale manufacturing. These are highly intellectual occupations not yet universally recognized as on a level with divinity, law and medicine. The American universities will, in a few generations, put them all in their higher grades absolutely on a level with the older callings." * * *

*FORESTRY REPORTS ON THE LANDS OF MAKUA
AND KEAAU, OAHU.*

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on Dec. 27th, 1905, the following reports by the Committee on Forestry and the Superintendent of Forestry, were adopted and ordered placed on file. They are published here in accordance with the established usage of the Board:

REPORT OF COMMITTEE ON FORESTRY.

Honolulu, T. H., Dec. 6, 1905.

Board of Commissioners of
Agriculture and Forestry,
City.

Gentlemen:—Your Committee on Forestry beg leave to report that it has had under consideration the report of Superintendent

of Forestry Hosmer, concerning a recommendation for a forest reserve on the lands of Keaau, Ohikilolo, Makua and Kahanahaiki, on the Island of Oahu.

Your Committee has consulted both the Land Commissioner and the Territorial Surveyor, both of whom are acquainted with the location in question. They both stated to us that they had no suggestions to make. Surveyor Wall stated that he considered it the proper line for the forest reserve. Land Commissioner Pratt stated that before giving his final opinion on the matter he should want to visit the land again.

The Chairman of your Committee is well acquainted with the land in question and has been for many years, and he is of opinion that the proposed line is in the right place.

Your Committee therefore recommend that the forest reserve on the lands in question as recommended by the Superintendent of Forestry in said report of November 29th, 1905, be adopted, and that this Board recommend to the Governor in usual form the setting apart of said land so described as a forest reserve under the statute, reserving, however, rights of way from the lands of Kahanahaiki and Makua to the government land of Kuokala, lying on the northwest side of said lands of Makua and Kahanahaiki.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

ALFRED W. CARTER,

Committee on Forestry.

REPORT OF SUPERINTENDENT OF FORESTRY.

Honolulu, T. H., Nov. 29, 1905.

Board of Commissioners of

Agriculture and Forestry,

Honolulu, Oahu.

Gentlemen:—I have the honor to submit the following report upon the lands of Keaau, Ohikilolo, Makua and Kahanahaiki, Oahu, following an examination of the same made at the verbal request of Mr. J. W. Pratt, Commissioner of Public Lands, to determine the forest line. On Oct. 12th and 13th, 1905, in com-

pany with Hon. L. L. McCandless, I visited the lands, going over the ground with him and examining the local conditions.

The lands named are situated on the leeward side of Oahu, in the District of Waianae, some 40 miles from Honolulu by railway. Ohikilolo belongs in fee to Mr. McCandless. Its exact area I do not know, but it is in the neighborhood of 700 acres. The others are government lands. Makua is under lease to Mr. McCandless, the lease expiring Feb. 12, 1910. Keaau and Kahanahaiki are not under lease. The areas of these three lands as given in the Land Office list, are respectively 2,628, 2,431 and 690 acres.*

The lands lie in two roughly semi-circular basins, between two and three miles deep by from one to two miles across, running back from the sea to the ridge, making the backbone of the Waianae Range and framed in by the lateral knife-edge ridges that form their other boundaries. One of these lateral ridges separates Makua from Ohikilolo and Keaau, while a smaller one sets off Kahanahaiki from the larger valley of Makua.

The floor of each valley rises gradually from the sea to an elevation of 1,000 feet or more, perhaps two-thirds of the way to the head of the land. Above this the slopes grow rapidly steeper until they become precipitous.

The lower portions of the valleys, near the shore, contain land valuable for agriculture, including the raising of sugar cane; higher up the chief value of the land seems to be for grazing, while the sides of the steep ridges are unfit for any economic use.

Being on the leeward side of the island there is scant rainfall and as the catchment area is small the water supply is limited. One spring in each valley was visited, which is said to be the only water that is developed naturally. Wind-mills near the beach give the local domestic supply. The spring on Makua is on a kuleana not shown on the map and is piped down to a watering trough, located on another kuleana, both owned by Mr. McCandless. Some tunneling has been done to increase the flow of the spring, with beneficial results. On Keaau the spring is well up in the valley on the side of one of the minor gulches. From each spring it is estimated that a minimum flow sufficient to fill a half-inch pipe could be depended on.

* The new land list, issued during January, 1906, gives different areas for these lands; respectively 2544, 2420 and 1360.

Owing to overstocking with cattle in the past and the presence of wild goats on the ridges the forest cover on these lands has been practically destroyed. Groups of kukuis and other trees are found in the upper parts of the gulches and scattering individuals occur on the slopes, but for the most part the forest has disappeared. Only a moderate number of cattle is now pastured on the land and the goats are said to be less in evidence now than they were some years ago, before there was so much hunting as at present. Judging from the young trees that are coming up, the forest would again appear on the lower slopes were the cattle excluded and the goats killed off.

The gulch beds show that at present the greater part of the rain that falls during times of heavy precipitation rushes to the sea as flood water. While the rainfall is not constant enough nor the catchment basin large enough to permit of permanent streams, a forest cover would undoubtedly help matters by retarding the run off and making available for use at least a part of the water that is now lost in floods. It would appear also that the existing springs would have a larger flow were the slopes from which they are fed covered with vegetation.

The proposition on these lands then, is to fix a line above which the slopes ought to be brought under and kept permanently in forest. But before making definite recommendations one or two points have yet to be touched on, as they affect the location of the line by making it desirable to bring it a little lower down than might at first seem necessary.

Above the gently sloping land and below the steep upper slopes is a section too steep to be good grazing land, yet not steep enough to prevent cattle from working on it. This area should, in my judgment, be included in the forest reserve. It is just here that a forest cover would be of value, for this section is particularly subject to erosion, which if continued leads to the undermining of the steep slopes above and the consequent washing down of rock and debris onto the good land below. This is the section where the springs break out and furthermore, in the places where fencing is required the cost of construction would be materially lessened by building just below rather than across it, for this section is much cut up by small gulches.

It is true that there are now one or two small flats above the proposed line, especially at the head of Keaau, but if erosion goes on at its present rate these will soon disappear. In Keaau valley

there is a strip of moderate steepness extending from the eastern edge of the main gulch to the foot of the steep pali, which might be used for grazing, but for the reasons just given I believe it would be better under a forest cover.

The red line on the accompanying blue print shows the line which I recommend be adopted as the forest reserve boundary. This may be roughly described as follows:

Starting at a point on the Makaha-Keaau boundary, at the foot of the steep pali, somewhat above the railway, the forest line should follow the foot of the steep pali around and into the main Keaau Valley, thence up the valley on the western side of the main stream bed to a point at the head of the large flat in the center of the valley. Thence to the point on the Ohikilolo boundary, at a large hau tree, where the line turns toward the ridge, thence to and along the foot of the steep pali on the Ohikilolo ridge to the boundary line between Ohikilolo and Makua, thence up and across the ridge making said boundary and along the foot of the steep slope on the eastern side of Makua Valley to a point at the head of the main flat, thence across the valley to and along the foot of the steep slope on its western side to the Kahanahaiki boundary, thence around the Kahanahaiki Valley, following the foot of the steep slope, to a point near the shore where the pali rises above the railway, thence along foot of said pali to the Keawaula boundary.

And I further recommend that the proper steps be taken to have the portion of the above named lands, within and mauka of the proposed line, set apart as a forest reserve.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY OF THE BOARD OF AGRICULTURE AND FORESTRY.

BY JACOB KOTINSKY.

SOAP AND SCALE INSECTS.

One needs but to mention such pests as the Avocado Pear scale (*Pseudococcus nipae*, Mask.) and the Purple scale (*Lepidosaphes beckii*, Newm.), both scale insects, to realize the importance of this class of insects in a tropical or sub-tropical country. Al-

though but some fifty odd species of scale insects were hitherto recorded from these Islands, a number of others have since been discovered and one may safely estimate the number of scale insect species on these Islands to be in the neighborhood of one hundred. Some of these are comparatively rare, others are too inconspicuous to be noticed by the casual observer; while a large number of them are so well kept in check by the predaceous and parasitic insects introduced by Mr. Koebele, in course of his work here, that while colonies of them may be found here and there, their injury is insignificant. But we still have a few species, such as the Purple scale above referred to, which are not kept in check effectively by the enemies praying upon them and which find the environment satisfactory for rapid multiplication. The amount of damage that they inflict cannot adequately be estimated for the reason that the plants they attack are only to a very limited extent cultivated on a commercial basis. Yet nearly every door yard, urban or suburban, has its citrus trees, avocado pear trees, guava, etc., and the owners of these know the blighting effects of the scales infesting these trees. Indeed, one observes many plants with leaves crumpled up and mis-shapen, the effects of colonies of scale insects ultimately destroyed by lady-birds, and wonders if it were not in wisdom's course to have mechanically, as by means of a soap wash, killed outright the infesting scales and thus prevented the unsightly appearance, to say nothing of the damage.

Unless every single species injuring a plant is taken care of by natural enemies, if the plant is to be saved from destruction, artificial remedies become inevitable sooner or later. And when the application of the remedy is made it is bound to affect practically every form of life upon the treated plant, anyway. Wanton destruction of beneficial insects shows poor knowledge and judgment, and is wrong, but the occasional killing of a beneficial insect in course of a useful and necessary application is decidedly pardonable.

Let us take for illustration an orange tree. Following is a list of insects that affect it and their natural enemies:

Pests.	Their effective enemies.
Purple scale	Practically none.
Mealy bugs	Lady-birds (<i>Cryptolaemus</i>).
Aphis or plant lice	Lady-birds.
Florida red scale (<i>Chr. ficus</i>)	Practically none.

From this it will be seen that while we can depend upon lady-birds to keep citrus trees free from mealy bugs and plant lice without doing anything for them, we cannot hope for similar results in the case of the Purple and the Florida red scales. Even then the writer has observed time and again lime trees with every leaf upon them creased and crumpled all out of shape by colonies of mealy bugs, which when examined have already been destroyed by lady-birds. Now in order to save those trees from destruction by the unchecked scales, spraying will be necessary sometime. In our equable climate and the consequent continual breeding of scale insects the application of a soap wash is equally effective at any time of the year, so that if it is made at the first appearance of the mealy bug upon the lime trees mentioned, aside from killing many purple scales, it would have also prevented the mis-shapen appearance of the leaves. It becomes evident from these facts that spraying of scale infested trees is feasible, eminently necessary, and does not conflict with our regard for the beneficial insects present.

SOAP WASH.

Upon recommendations from this office the soap wash has been repeatedly used on this and other Islands against the purple scale and the reported results were invariably very satisfactory. It is so inexpensive, so simple, so easily prepared and applied and at the same time proven to be efficacious that it becomes necessary to make the preparation of it more generally known. The proportions are

Soap 1 lb.

Water 4 gallons.

Dissolve 1 lb. of soap in a gallon of water and while it is still hot pour into the vessel containing the other three gallons. This will render the entire mixture sufficiently warm so that it will not clog the spraying nozzle. Any kind of soap will answer the purpose, though usually whale oil or soft soaps are recommended as preferable. In the case of very tender plants affected with scale insects or plant lice, ivory soap, because of its neutral properties, is probably the safest. Let it be stated here once for all, that we have every reason to believe that the soap wash here recommended is effective against all scale insects and plant lice in Hawaii, provided, it is made judiciously. It is known, for instance, that the eggs of the purple scale are not killed by the wash in the strength above given, but if it is repeated some

three or four times at intervals of three or four weeks, the scale will be pretty thoroughly subdued, for the reason that the interval will allow the eggs to hatch and the application will cover them while they are still young, when they are most vulnerable. We must also bear in mind that a heavy rain will wash off most of the application which should, therefore, be repeated soon thereafter. Let us also remove the erroneous impression that the causticity of the soap makes the soap wash effective. The fact is that it kills the insects principally by excluding the air, by choking; for the water is evaporated soon after the application is made, and the film of soap that is left forms a complete blanket about the insect and prevents the penetration of air. Best results will, of course, be obtained by the most thorough application, for it is seen that in order to kill it, the wash must actually cover every individual insect upon the plant. Yet, it is not advisable to apply much of the wash upon a single spot, for it will tend to collect by the force of gravitation in the lowest point of the spot or leaf, leaving the rest almost bare. Best results are obtained by means of a nozzle that produces a very fine spray, which should be moved about rapidly and not left playing long upon a single spot.

SPRAYING APPARATUS.

Now as to apparatus, in the writer's opinion every household should be supplied with a knapsack spray pump, preferably one in which the pump is worked by hand, just as it is supplied with a lawn mower. To his knowledge Gould's (The Gould Mfg. Co., Seneca Falls, N. Y.) "Handy" knapsack pump is one of the most serviceable apparatus. A cheaper instrument, though somewhat less handy, is a bucket pump. This is so arranged that it is fastened to the bucket and a foot may be placed upon it to keep it in position, while the operator manipulates the pump handle with one hand and the nozzle with the other. "Vermorel" is one of the standard nozzles in use for spraying purposes. For extensive operations a barrel pump, carried about upon a wagon, or even power pumps are fitted out, but in our Territory we have as yet no excuse for these larger implements of war. Californians are familiar with these outfits, for in that State, too, despite the presence of numerous beneficial insects, they are still afflicted with pests against which they are compelled to employ spraying or fumigating apparatus and substances.

MISCELLANEOUS NOTES.

Compiled by JARED G. SMITH, Director, Hawaii Experiment Station.

The consumption of cocoa and chocolate in the United States amounted to 397,066 tons in 1904; that of Germany, France, Holland and Great Britain, to 101,031 tons. Imports into the United States have doubled since 1898.

The cotton States of the South pay \$100,000,000 annually as wages to cotton pickers. One laborer can pick about 100 pounds of cotton per day. A new mechanical cotton-picker, which is being operated extensively in Georgia, Alabama, Louisiana and Mississippi picks cotton at the rate of 200 pounds per hour. It is estimated that the general employment of this type of machinery will save \$75,000,000 per annum to the growers of the South. The machine in operation requires a mule team or gasoline motor, driver and four operators. The latter are seated on the machine, and each works two mechanical, aluminum arms four feet long, moving in a universal joint. Along each arm moves an endless belt of cloth and rubber at the rate of 360 feet per minute. The belt is studded with hooks, the slightest contact with which is sufficient to remove all the fibre from the boll. The cotton passes rapidly along the belt until it reaches a brush, which sweeps the lint into a receptacle prepared for it. Using this machine five laborers can pick from 2,000 to 2,400 pounds of cotton per day, and it grades better than that picked by hand.

Capt. Baker, the founder of the United Fruit Co., gives it as his opinion that if some use can be found for the juices of the banana plant it would pay to extract the fibre from banana stems. The fibre averages 1.8% of the weight of the plant. Banana fibre would have to compete with wood-pulp for paper stock and would probably not sell for more than \$50 to \$100 per ton, the latter price being obtainable only in years when there is a shortage of sisal and manilla hemp. It has been estimated that 20,000 acres of bananas would produce 9,000 tons of fibre per annum—worth from \$450,000 to \$900,000, or \$22.50 to \$45 per acre. If some use can be found for the acrid juice of the banana plant the problem of profitable fibre extraction will undoubtedly be soon solved.

Ninety per cent. of the common people in Porto Rico, according to a recent P. R. Govt. Report on "Anemia in Porto Rico," are infested with intestinal parasites. The further startling statement is made that 30% of all deaths in that island are due to "Anemia," a disease caused by these parasites. Up to 1899 Anemia was considered to be due to insufficient or faulty diet, and was in turn attributed to malaria, climate, lack of hygiene, etc. Later it was one of the things laid at the door of "American Occupation" and the Hurricane.

The parasites now known to be the sole cause of Anemia are minute blood-sucking worms, one-fourth to one-third inch long. Contrary to previous supposition it has been proved that infection takes place solely through contact of the skin of the human body with wet earth or mud containing the microscopic eggs of the worm. The motile ova pierce the skin causing a characteristic eruption at point of entrance and migrate thence through the tissues until they reach the body cavity. They then pierce the intestines and attach themselves to the inner mucous membranes and suck the blood directly from the capillaries.

Anemia owes its prevalence to soil infection from human excrement. It is a disease of the "bare-footed peoples." The eggs of the worms are killed by drying or exposure to sunshine. For this reason sugar plantations are comparatively free from Anemia, while the Porto Rican coffee estates are said to fairly reek with it, the shade and moisture furnishing ideal conditions for the long life of the eggs of this worm in the soil.

The Anemia of Porto Rico has been found to be identical with "minè sickness" or "tunnel sickness" of England and Germany. It is common among laborers in brick yards. It also occurs in certain districts of the Southern States, in Egypt, South America and probably, at least sporadically, in all the countries of the globe. Prevention consists in rigid enforcement of the use of latrines by laborers working in infected districts, and medical treatment of the sufferers. Specifics for this parasitic worm are thymol and Beta-naphthol, both of which are powerful drugs which should be administered only by physicians.

The very thorough investigation of this wide-spread tropical disease reflects great credit upon Capt. B. K. Ashford, Asst. Surgeon, U. S. A., the chairman of the commission named by Governor Winthrop of Porto Rico to study and report upon it.

The State of Sao Paulo, Brazil, has 1,908,000 acres planted in coffee. There are 545,000,000 bearing trees and 140,000,000 trees that will come into bearing within three years.

Sao Paulo has 4,585,000 acres of land suitable for coffee. Four hundred and twenty thousand laborers are employed during the picking season. The coffee trees are worth \$312,000,000. The average yield per 1,000 trees is 2,300 pounds.

The methods in use are entirely unlike the Hawaiian practice in coffee growing. The picking is deferred until the whole crop of cherries has ripened. The laborers then strip the cherry off the branches, allowing fruit, leaves and twigs to fall on the ground. When the trees have been stripped the fruit, with dirt, sticks and stones is raked into heaps, shoveled into wagons, or cars on portable track, and transported to a river, stream or flume, to be washed in sluice-boxes. These deliver the cherry free from sticks, stones, dirt and rubbish. The cherry is then transported to huge, open-air drying floors of cement or clay. The sun-dried cherry is run through hulling machinery, graded and polished, and, when bagged, is ready for market.

Santos coffee may, therefore, be produced and marketed at a profit at prices which would drive our Hawaiian growers out of business.

Labor, during the picking season, commands high prices and there is always a shortage during that period. Even paying the higher prices that labor commands during the busy season the Brazilian growers can produce coffee at a lower price and still make a profit, because their methods of picking and handling the crop are cheaper than ours. The Sao Paulo method is also better adapted to the needs of the small individual planter who can market his coffee to the large planters and mill owners in the dried cherry, practically the only investment of capital, other than his own labor, that is required, being the comparatively small cost of a drying floor.

This simplification of methods is responsible for the enormous over-development of the coffee industry of Brazil. Hundreds of thousands of European immigrants, German, Italian and Portuguese, have poured into this salubrious, rich and well-watered region. As large an area as has been already planted is still available for the development of this industry in Sao Paulo alone.

Extraordinary inducements have been offered by this and other Brazilian States, in the way of lands, prepaid ocean-transportation, loans to settlers, and in some instances guarantees of at least \$400 wages per annum. Road and railroad development have kept pace with the settlement of the land.

The price of labor is approaching a parity in all civilized countries within the tropics. A land or an industry which has an advantage over other lands and industries, through the possession of cheaper labor, more fertile soils, more stable government or legislative, and hence artificial protection can be depended on to rapidly bring itself up to the general average because of the universal desire to take abnormal profits. Sooner or later and, now-a-days, sooner, the endeavor to get out of an industry all there is in it, consequent upon this phase of human nature, will bring about over-production. Sometimes there is actual over-production of crops resulting in readjustment of prices in the world's markets, and wide-spread ruin in far distant lands. The synthetic over-production of indigo in Germany became a famine factor in India. But modifications in indigo manufacture in India have again placed the Indian ryot on a plane of fair competition with German synthetic manufacturers.

Again, over-development takes the form of planting a larger area of land than can possibly be cultivated by the visible supply of laborers. This was the secondary cause of over-production of coffee in Brazil, and is somewhat of a factor in Hawaii to-day, affecting the cost of production of sugar. The world-wide remedy for this latter phase is to substitute small land owners for the plantation system of corporate ownership of land and the employment of laborers in masses.

This remedy is being applied to relieve the coffee situation in Brazil.

The world's production of tobacco in 1903 was 2,205,174,000 pounds. The United States leads with 815,972,000 pounds. Next in order are:

British India	441,000,000 lbs.
Russia	174,000,000 "
Hungary	134,567,000 "
Japan	95,148,000 "

Germany	72,911,000 lbs.
Turkey	66,000,000 "
Java	59,274,000 "
France	57,466,000 "
Brazil	55,000,000 "
Sumatra	50,721,000 "
Cuba	37,700,000 "
Mexico	20,000,000 "

The returns for 1904 are not all in but are, as far as reported:

United States	660,461,000 lbs.
Cuba	45,748,000 "
Germany	75,794,000 "
Austria	14,047,000 "
Roumania	4,000,000 "

The 1905-6 world's production of raw silk is estimated at 40,-075,508 pounds, as against 41,998,821 pounds for 1904-5.

Mr. F. O. Licht's estimate of the production of sugar in Europe in 1905-6 as compared with the previous year is as follows:

Countries.	1905-6. Tons (2,240 lbs.)	1904-5. Tons (2,240 lbs.)
Germany	1,997,955	1,465,167
Austria-Hungary	1,304,412	816,635
France	872,670	571,369
Russia	973,716	872,670
Belgium	298,545	158,918
Holland	183,720	124,930
Others	385,812	313,243
Total	6,016,830	4,322,932

The 1905 apple crop of the United States is commercially estimated at about 23,500,000 barrels as against 45,400,000 barrels in 1904.

The 1905 hay crop of the United States is reported as short in quantity and poor in quality. Dealers east of the Rocky Mountains report slow movement of the crop because of a car famine. Prices rule much higher than in 1904.

THE VEGETABLE GARDEN.

BY F. G. KRAUSS.

DECEMBER.

The illustration accompanying this month's "Notes," "*A December Vegetable Harvest at Kamehameha*," suggests what any out-of-door home-garden about Honolulu might offer at this season of the year, and for that matter, during any other season.

The basic requirements are the planting of suitable kinds, and *intelligent and persistent management*. The success of our Chinese vegetable gardeners is principally due to the application of the latter important requisite, to the lack of which most failures among ourselves may directly be traced. If to the patience and perseverance of the Asiatic we add greater intelligence and a better knowledge of new and improved varieties, or perchance create new sorts ourselves, as some of the leading truck-gardeners of the mainland are constantly doing, why then may we become proportionally advanced over present accomplishments, and with added pleasure and profit thereto.

The varieties of vegetables represented in the illustration are:

Snap-beans—Kamehameha Selection, Golden Wax.

Garden Beets—Improved Blood Turnip Beet.

Cabbage—Sure head or Imp. Flat Dutch.

Carrots—Half Long Orange, Chantenay and Scarlet Horne.

Sweet Corn—Kam. Selection of Mammoth Sugar.

Lettuce—Improved Deacon, Hanson, and The Morse.

Onions—Australian Brown, green for table.

Radish—Imp. Chartier and Rose Queen.

Squash—Hubbard, Heart O'Gold and White Scalloped.

Sweet Potatoes—White, yellow and red varieties.

Swiss Chard or *Sea Kale*.

Tomatoes—New Stone, Acme, Honor-Bright, Spark's Earliana and Red Cherry.

The standing corn pictured in the background is six to eight feet high and makes one of the most succulent and nutritious fodders for milch cows after the roasting ears are harvested.

In order to conclude in this number the series of "notes" on vegetable-growing, which have appeared in the current volume of the Forester and Agriculturist, it is necessary to omit varieties of lesser importance.

MUSTARD—*Sirapis* sp.

Anyone having failed with all other crops might try mustard as a last resort. The improved varieties, of which Burpee's "Fordhood Fancy" is a good example, are very desirable, when young, for salads and garnishing. It is one of the best vegetables for early "greens" and when cooked like spinach, is by some considered superior to that vegetable in flavor.

In California the common coarse growing variety has become a pest in grain fields. It is quite as easily grown here; the improved sort is not likely to become troublesome and should be given a trial by all who like a piquant salad or a good substitute for spinach.

A rich moist soil is best for succulent rapid growth. Sow the seed thickly in rows ten inches apart. Within three weeks the first leaves may be cut for salad, and a few weeks later they may be harvested for greens. Additional sowings may be made every week or two, to obtain a continuous succession of tender plants. Twenty feet of drill will keep a family supplied. Keep the plants free from weed and hoe frequently.

OKRA OR GUMBO—*Hibiscus esculentus*.

This vegetable thrives in our climate, and should become better known. The young pods sliced and cooked make a splendid stock for soups and stews. They form the base of the famed gumbo soup of the French, and a few plants will supply a large family with their useful pods.

In rich soil the plant makes a large growth and should be planted accordingly. Sow the seeds in drills or hills, allowing about four square feet per plant after thinning.

Improved Dwarf Green, White Velvet and N. J. "Perfected" Perkins Long Pod are standard sorts. The former requires less



A DECEMBER VEGETABLE HARVEST AT KAMEHAMEHA.

A DECEMBER VEGETABLE HARVEST AT KAMEHAMEHA.

(See Figure.)

Varieties illustrated: *Snap-beans*—Improved Golden Wax, Kam. Selection; *Garden-beets*—Improved Blood Turnip Beet; *Cabbage*—Sure Head, or Imp. Flat Dutch; *Carrots*—Half Long Orange, Chantenay and Scarlet Horn; *Sweet Corn*—Kam. Selection, Mammoth Sugar; *Lettuce*—Imp. Deacon, Hanson and The Morse; *Onions*—Australian Brown, Green Bunch Onions; *Radish*—Imp. Chartier and Rose Queen; *Squash*—Hubbard, Heart O'Gold and White Scalloped; *Sweet Potatoes*—White, Yellow and Red varieties; *Swiss Chard* or *Sea Kale*; *Tomatoes*—New Stone, Acme, Honor Bright, Spark's Earliana and Red Cherry.

room than the other varieties and pods earlier. The latter is the variety principally used by soup canners. Considering its prolific and continuous podding under our conditions, this crop might prove profitable for drying, and exporting, considerable quantities being used in that form.

ONIONS—*Allium cepa*.

F. ognon. G. zwiebel. P. cebola.

With dry bulbs at from two to four cents per pound in the Honolulu market, with a large and constant demand, it seems a little strange that no enterprising truck-gardener should have undertaken the culture of onion bulbs on a sufficiently large scale to supply, at least, island needs. At present large quantities are imported from California and Australia.

While the onion crop is most exacting, under skilled management, a number of varieties do exceedingly well here. Not quite as prolific and large, perhaps, as the California product, yet sufficiently so, and of such excellent quality that we can ordinarily compete with the imported article.

At Kamehameha Farm, the Australian Brown variety has succeeded best, while not so large as some of the standard American sorts, it is unusually firm and a splendid keeper.

Prize Taker and Large Red Withersfield, two favorite California varieties, have also done fairly well with us, likewise Yellow Danvers.

Anyone contemplating onion culture for bulbs, should make an exhaustive variety test, covering several seasons. Fully twenty standard sorts are listed by seedsmen and it may require several years of careful selection to produce a strain that will best meet local conditions.

A reasonable price should be paid for seed and that of best quality only sown. Cheap onion seed is usually worse than useless, and is dear at any price, as the writer can attest from the handling of many tons as a seedsman.

Prices fluctuate from year to year, single pound lots range from 75 cents to \$2.00 per pound, according to variety and season.

Sown in drills 12 to 18 inches apart requires from 5 to 8 pounds of seed to the acre. One ounce will sow 100 feet of drill.

It will pay to utilize the richest soil available for this crop. Next to fertility, freedom from weed-seeds is of most importance.

Do not attempt to sow onion seed in foul ground; the cost of hand weeding the onion crop has nearly landed some onion-growers in the poor-house. In other words prepare your soil before sowing rather than after planting. Nothing pays better in this crop than good seed and thorough tillage. As "mellow as an ash heap" is a good condition to have your soil in. Those fortunate enough to have such soils, should take care to *firm* the soil over the seed immediately after sowing. The seed should not be covered over one-half inch in depth. When the plants are three inches high, thin out to three or four inches apart. In growing onions on a moderately large scale, no better hand implements can be used than the "Planet Jr." line; with the various attachments supplied with these machines, drills can be made, fertilizers distributed, seed sown, covered and rolled all at the same operation, necessitating, of course, a perfect condition of the seed bed; later the wheel hoe, rakes, etc., may be used to cultivate and harvest the crop. When bulbs have attained their full size and maturity as indicated by the dying down of the tops, they are ready for harvest, which should be carefully done to insure good keeping qualities. Two hundred and fifty to 1,000 bushels per acre is the range of yields, though as high as twenty-five tons has been reported from the best favored California regions; such yields, however, mean very low prices.

To grow "bunch" or green onions from sets, requires very little skill, and no kitchen garden is complete without a family supply of this wholesome vegetable.

PEAS (garden varieties)—*Pisum sativum*.

F. pois a ecosser. G. schal-erbsen. P. ervilhas do grao.

The successful growing of garden-peas must always be limited to the short cool winter-spring season in our low lands; heat, especially dry heat, is disastrous to this crop. Our best efforts with a large number of varieties have produced indifferent results, though it should be said that at the Kamehameha Girls' School, the old standard, Yorkshire Hero, also known as the Alameda Sweet Pea in California, has done exceedingly well during some seasons. A light, moderately rich soil is considered best for this crop. The dwarf varieties may be sown in drills two feet apart, medium and tall sorts four to six feet apart. One pound of seed will sow 75 feet of drill.

PEPPERS (Chile)—*Capsiam annuum*.

The prevalence of the small cayenne peppers all over the Islands speaks well for its adaptability to our conditions. No vegetable seems freer from insect or fungus pests than this plant, and its productiveness is marvelous. Being perennial it does not require re-planting, and when propagation becomes necessary it is readily grown from cuttings.

The mild flavored, large fruited sorts also do well with us, and a few plants should find a place in every garden. The following are standard sorts that have succeeded well at Kamehameha: New Chinese Giant, Ruby King, Large Bell or Bull-nose, Red Chili, Black Nubian and Golden Dawn. The former is a beautiful fruit, sometimes attaining a diameter of five or even six inches, and the "sweetness of an apple."

Sow the seeds in a nursery-box, and when sufficiently large for transplanting, set out 18 inches apart in rows two feet apart.

RHUBARB—*Rheum sp.*

F. rhubarbe. G. rhabarber. P. ruibarbo.

Anyone interested in experimental horticulture, would do well to give rhubarb a trial. It is a delicious vegetable, and the writer sees no reason why it should not thrive in island regions suitable to its fullest development, of which there should be ample for home requirements. In California it thrives on a great variety of soils—from heavy clay to light peat, providing ample moisture is available.

A fine lot of some fifty plants, grown from imported root, divisions of Luther Burbank's Australian crimson introduction, were planted several years ago and became well established. Two or three cuttings were made, when after a protracted wet spell, one after another of the plants died. Doubtless, had the plants been "lifted" and cut back they might have been saved. Stress of other cultures has thus far prevented further trial. Monarch, Victoria and Linnaeus are the varieties grown in California. Burbank's Australian crimson is a very promising sort and should be grown in comparison with the old standard varieties.

Much time is gained by planting root divisions instead of seeds. They should be set two by four feet apart.

SQUASHES.

MAMMOTH SQUASHES OR PUMPKINS—*Cucurbita maxima*.

F. potirons. G. melonen-kurbiss. Italian, zucca.

MARROWS, SCALLOPS, ETC.—Summer varieties, *Cucurbita pepo*; winter varieties, *C. maxima*.

Squashes are of two distinct types: the early maturing, so-called summer varieties under which may be classed the white and golden scalloped bush, the summer marrows and crook-necks, etc. The so-called winter sorts produce large, hard-shelled fruits, suitable for winter storing; the old standard Hubbard variety being a characteristic representative, Large Boston Marrow, Mammoth Chili, etc., are other standard winter varieties.

A few plants of the bush and trailing varieties of squash should be in every garden, if room is limited one may confine himself entirely to the bush varieties, thus economizing space. These have the further advantage of early maturity and the readiness with which they may be protected from the disastrous fly.

The rarity of choice Hubbard squash in the Honolulu market at this season of the year should be suggestive to the market gardener. During Thanksgiving week in 1903, not a Hubbard squash was obtainable in our local market until the Kamehameha Schools sold 500 pounds, at five cents per pound, to an enterprising green-grocer, who called for more three days later.

The cultural directions given for melons apply to the growing of this crop, except that the bush varieties may be planted more closely, two or three feet apart each way. We have obtained best results from early spring and late fall sowings, when the fly pest seems least prevalent. Middle of August planting will bring Hubbards for the November and December holidays.

TOMATOES—*Lycopersicum esculentum*.

F. and Spanish, tomato. G. liebesapfel.

With good plants to start with, tomatoes would be an easily grown crop during the entire year, were it not for the fly nuisance. It is almost impossible to guard against this pest, and many otherwise fine fruits are injured by its unceasing attacks, except in a few favored localities. We know of no specific remedy

against the fly, if we or any one else did, our melon, squash and tomato troubles would be at an end. Unless our entomologists find a parasitic insect to prey upon these garden foes, it is up to the horticulturist to produce resistant varieties. All familiar with the small cherry tomato, which has run wild along our roadsides, must have noticed its immunity from attacks of the fly. Mr. Byron O. Clark, of Wahiawa, has grown a plum-shaped tomato of moderate size and excellent quality for several years, which is said to be entirely resistant. Perhaps success is to be looked for along these lines, as in the case of the grape against phylloxera.

The following are standard varieties:

Acme—Early ripening, of medium size.

Beauty—Medium, early, large, finely formed.

Favorite—One of the largest perfect-shaped, deep red.

Honor Bright—Grows in clusters, choice.

Paragon—Large, solid and smooth as an apple.

Ponderosa—Largest of the family, but not finely shaped.

New Stone—Large, handsome, productive.

Trophy—Standard late variety, good canner.

Golden Queen—A large, smooth, pure yellow tomato.

Of the small fruited, ornamental varieties, the following may be mentioned: Red and Yellow Pear, Red and Yellow Plum, Red and Yellow Cherry, Burbank's Preserving, the latter a most distinct variety, bearing its fruits in clusters like currants. The first aim of the gardener should be to produce good, stocky young plants of his chosen variety, in the meantime adequately preparing a choice well-sheltered piece of ground, to which the plants should be transplanted, preferably on a cool cloudy day. Water immediately after setting and give clean culture. Cutting the plants back makes them more stocky and self-supporting but the rank growing varieties are better trellised.

If stable manure is used it should be thoroughly rotted and applied to the field before the plants are set out. After the plants are well established and dry weather approaches, a mulch of straw or grass will be found beneficial in keeping down weeds and retaining moisture. A quick-responding commercial fertilizer may be cultivated in during the plant's development; 50 to 100 pounds nitrate of soda as a top dressing around the plants often producing good results.

For rot, spray with Bordeaux mixture once weekly, after fruit begins to form. For leaf blight, spray with Ammonical copper

carbonate solution soon as there are any indications of the disease. Up-root and burn badly infested plants.

SWEET POTATOES—*Convolvulus Batatas*.

F. patate douce. G. batata. Spanish, batata.

Sweet-potatoes are an important and almost universal crop in the Hawaiian Islands, and their culture is so simple and so well understood that it is not necessary to enter into details here. The tuber seems to thrive every where, on the steep dry slopes of Punchbowl or in the low reclaimed muck of the taro-patches.

At Kamehameha the white, yellow and red varieties are regularly grown. The white variety is considered decidedly the best, both in quality, productiveness and earliness.

MISCELLANEOUS.

ROSELLA—*Hibiscus Sabdariffa*.

This plant has recently come into prominence as a jelly plant, and it certainly is very excellent for that purpose. It is widely cultivated in the tropics and grown on a small commercial scale in Southern Florida and Southern California, for its fleshy calyxes, which when cooked make an excellent sauce or jelly with the flavor of cranberry. The juice of the calyxes also makes a fine cooling acid drink, and might be introduced by some enterprising druggist at his soda fountain.

Rosella has been grown at Kamehameha for several years, the plant is a strong grower and attains a height of five to eight feet. With us a full year elapsed before the plants come into flower, when they blossomed profusely, and continued so for an extended period. The greatest drawback is the amount of work necessary to harvest the sepals.

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(Concluded.)

PEPPERS.

A shipment of peppers from the Nevis Experiment Station, recently forwarded to London by the Imperial Commissioner of Agriculture, has been disposed of at very good prices.

The consignment consisted of sixty-four pounds net weight of yellow Nepaul peppers and fifty-three pounds of ordinary red chillis.

The former realized the very high price of fifty-one shillings per hundredweight. This, however, is not, according to the brokers' report, to be attributed to their intrinsic value, but to their being in a very small lot and to competition between two bidders who particularly wanted them. "We should not think it safe to expect more than thirty shillings per hundredweight for any quantity."

The red chillis realized twenty-six shillings per hundredweight. These were reported slightly mouldy and would appear not to have been properly dried before shipment.—*Agricultural News, Barbadoes.*

CORRESPONDENCE.

The following communication, written by Dr. Walter H. Evans, Chief of Insular Stations, has been received by The Forester for publication:

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
INSULAR EXPERIMENT STATIONS,
WASHINGTON, D. C., December 22, 1905.

"In the Commercial Advertiser of December 2, I noticed a report by Mr. Kotinsky of the occurrence of the green scale on vanilla plants in Hawaii, and the statement, 'It is the "green bug," a scale pest which, in seventeen years, wiped out the coffee industry of Ceylon.' I presume by green scale is meant *Lecanium viride*, as this species is reported on coffee and many other plants. Neitner, in *The Coffee Tree and its Enemies*, Ceylon, 1880, revised and corrected by S. Green, does not mention this species, but it is noted in *Insect Life*, Vol. 1, p. 293, as quite destructive in Ceylon. In *Insect Life*, Vol. 2, p. 17, kerosene emulsion is reported as having been successfully tried against the green coffee scale. In the same volume, p. 265, Cotes reports the successful use of kerosene emulsion in Ceylon over a sufficiently large area to test its practical applicability. Zimmermann, in *Teysmannia*, 9 (1898), No. 5, pp. 240-243, reports *Lecanium viride* in Java as being attacked and destroyed by a fungus, *Cephalosporium lecanii*.

"The statement referred to above that the destruction of the coffee in Ceylon was due to a scale insect was rather startling to me, as I had been taught that the coffee industry was destroyed by the leaf fungus *Hemileia vastatrix*. Some two years ago I had the pleasure of meeting in this city Dr. J. G. Willis, Director of the Botanical Gardens, Peradeniya, Ceylon, and as I had just been appointed Chief of the Division of Insular Stations, I was anxious to learn from him all that I could relating to tropical agriculture. Dr. Willis was quite definite in the statement that the destruction of the coffee in Ceylon was due to the leaf rust, and urged upon me the necessity of a rigid quarantine in Hawaii and Porto Rico against the disease. Similar directions were given me by Sir Daniel Morris, formerly at Ceylon, and now Commissioner of Agriculture for the British West Indies.

"In order to confirm or dispel the idea that I had formed, I have been looking over some of the treatises in the library that relate to tropical agriculture, and I find they practically all agree that the destruction of the coffee industry in Ceylon was due to the leaf rust, as mentioned above.

"Willis, in *Flowering Plants and Ferns*, Vol. 2, p. 93, says of coffee: 'The plant is subject to the attack of many insects and fungi, one of the latter (*Hemileia vastatrix*) was the cause of the ruin of the coffee industry of Ceylon.'

"Simonds, in *Tropical Agriculture*, 1889, mentions various insect pests of coffee, but calls particular attention to the destruction caused by *Hemileia vastatrix*.

"Nichols, in *Tropical Agriculture*, 1892, p. 105, says: 'In Ceylon the cultivation of coffee was practically ruined some years ago by a fungoid or vegetable blight which was found to be incurable.' Further he says: 'Insect enemies can be kept in control by cultural methods and the use of insecticides, principally kerosene emulsion.'

"Semler, in *Die Tropische Agrikultur*, 2d ed., 1897, describes at length *Hemileia vastatrix* as the greatest enemy of coffee culture, and calls especial attention to the destruction caused in Ceylon.

"Robert Wallace, in *Indian Agriculture*, says: 'The coffee industry in Ceylon was destroyed by the blight *H. vastatrix*.'

"Dybowski, in *Traité pratique de cultures tropicales* (1902), calls attention to the coffee leaf rust as the most serious enemy of coffee. In a similar way a number of others refer to the subject.

"The Hawaiian Coffee Planters' Manual, which was printed in 1894, on page 41, quoting from Ferguson's Directory of Ceylon, says: 'In the early days, black bug or blight affected the coffee plant very seriously, but who hears of blight now? One hundred thousand acres have been planted . . . and the area affected by bug has been most trifling. But the place has been more than filled by the most terrible of all diseases, *Hemileia vastatrix*, or coffee leaf disease.'

"In the pamphlet by Nietner, which I have mentioned above, the losses up to 1880 attributed to scale insects are given as £125,000, while the editor says the *Hemileia* caused losses of over £12,000,000.

"From the foregoing statements I think you will get some idea of my opinion relative to the green scale scare. I do not doubt but that, if this insect should become thoroughly established, it would cause great loss, but the rather extravagant statements referred to seem to me unwarranted, and they might result in causing alarm to the coffee growers if allowed to go unchallenged."

Yours very truly,

WALTER H. EVANS,
Chief of Insular Stations.

ORRIS ROOT CULTURE.

Referring to the very large number of inquiries received at the U. S. Department of Agriculture in regard to the subject of orris root cultivation in the United States, Prof. Rodney H. True, Physiologist in Charge of Drug Plant Investigations, Bureau of Plant Industry, makes the following statement:

As is well known, the orris root of commerce is grown almost exclusively in Italy, the chief centers of production being at Florence and Verona. The plants yielding this article are the common species of *Iris*, especially *I. florentina*, *I. germanica*, and *I. pallida*, cultivated widely as the common fleur-de-lis of many gardens. In many letters, advertisements are cited in which the cultivation of orris root is boomed as a quick road to wealth, and the conditions of the market are described in glowing but entirely

misleading terms. One advertisement states that orris root is worth 40 cents per pound, is protected by a duty of 25 per cent, and meets with an annual demand equaling \$2,000,000. On this basis, an offer of roots for cultivation is made at an excessive price. As a matter of fact, the average price of dried orris root of commercial grade varied between 3.8 and 9.6 cents per pound during the period from 1897 to 1904, inclusive. There is no duty on orris root. The total importation averages about \$20,000 annually. During the last two years the orris business in Italy has been in a somewhat dubious state, due to the low price realized and the lack of profit to the grower. Owing to such deceiving statements as above cited, there is a great likelihood that many people will be misled to their financial loss. Some advertisers claim to have the indorsement of the Department of Agriculture, whereas the Department has in no way suggested the culture of orris except on a small scale in a purely experimental way. It is of the opinion that the outlook for building up the orris industry in the United States is at present not good. Although a limited demand may arise for roots for purposes of cultivation, one should not fail to remember that an orris industry can be built up only on the basis of the utilization of the root in a commercial way.

THE HAWAIIAN STOCKBREEDERS' ASSOCIATION.

The Hawaiian Stockbreeders' Association held a session on December 18, for the purpose of hearing special reports and electing officers for the ensuing year.

A report was read by Dr. Victor Norgard, Territorial Veterinarian, on animal diseases. Mr. Kotinsky, entomological division of the Hawaiian Board of Agriculture and Forestry, made an address on horn-fly insects and lantana. Mr. Jared Smith, director of the Federal Experiment Station, read an address on imported grasses.

The election of officers resulted as follows: A. F. Judd, president; A. W. Carter, vice-president; A. M. Brown, secretary; R. W. Shingle, treasurer; E. P. Low, representative from Hawaii; L. von Tempsky, from Maui; J. F. Brown, from Molokai; Eric Knudsen, from Kauai, and H. M. von Holt, from Oahu.

IMPORTED SONG-BIRDS.

Foreign song-birds are much desired in this country for æsthetic reasons, but the Government is not disposed to encourage their importation, fearing lest they prove the reverse of a blessing. The skylark, so generally admired, and which has been made celebrated by poets, is a grain-destroyer in Scandinavia—for which reason the Bureau of Mammals and Birds has recommended that no more of this species shall be admitted.

Already a colony of imported skylarks has been successfully established near Portland, Oregon, and there is another at Flatbush, in the outskirts of Brooklyn. People often say: "Listen to the singing of the skylark!" Appreciative of its melody, they are glad that the bird should have been brought to us from foreign parts. As a matter of fact, however, it is the voice of the native thrush that they hear. They heard the same voice long before the skylark arrived on the scene, but did not listen.

The starling (a pretty bird that lives in large flocks) has been successfully imported from Europe, and is now quite plentiful along the Hudson River. It has not done any damage yet, so far as known, but in New Zealand, where it has been likewise introduced, it has taken to eating cherries and other fruit, and is regarded as a pest. The trouble is that a bird harmless in its native habitat may adopt new habits when transported to a different clime. In such matters it is safest to leave Nature alone.

The English sparrow is not a nuisance of much importance in the Old World, but how glad we should be to get rid of it! There is no hope, however—as may be judged from the experience of Bermuda, where this feathered pest has been domesticated. The total area of Bermuda is only forty-eight square miles, and yet in a war waged between the authorities and the sparrow the latter has come out emphatically a victor. Bounties paid for the destruction of the "rat of the air," as somebody once called it, nearly bankrupted the insular treasury without reducing appreciably the numbers of the birds.

Where game birds are concerned, our Government has no hesitation about permitting their introduction. They are large enough to be shot, and, if they become too numerous at any time, they can be reduced to the requisite extent by declaring an open season and inviting the sportsmen to tackle them without hindrance.—*Saturday Evening Post*.

THE FARMERS' INSTITUTE OF HAWAII.

Honolulu, Hawaii, Jan. 22, 1906.

NOTICE.

The annual meeting of the Farmers' Institute of Hawaii will be held at Kamehameha Schools on Saturday, February 3, 1906.

The programme will be as follows:

AFTERNOON SESSION.

2:30 p. m.—Business Meeting.

Report of the Secretary-Treasurer.

Election of Officers.

Report of Committee on Co-operative Marketing.

3:30 p. m.—Spraying Demonstration—

D. L. Van Dine.

J. E. Higgins.

4 p. m.—Inspection of the farm and shops of Kamehameha Manual Training School.

EVENING SESSION.

MusicKamehameha Glee Club

Address of Welcome.....President P. L. Horne

Response and President's Annual Address.....

.....Mr. Jared G. Smith

MusicKamehameha Mandolin Club

The Use of the Agricultural Colleges.....Prof. U. Thompson

MusicKamehameha Glee Club

Sisal and other Commercial Fibres.....Mr. Wm. Weinrich, Jr.

All those who are interested are cordially invited to be present at both the afternoon and evening sessions.

(Signed.)

J. E. HIGGINS,
Secretary-Treasurer.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
P. O. Box 331, Honolulu.

Vol. III

FEBRUARY, 1906

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL III.

FEBRUARY, 1906

No. 2

MUNICIPAL IMPROVEMENT.

The concerted action of the many local improvement societies which have lately been organized, is already having a beneficial effect upon the appearance of the city, and during the last few months unsightly neighborhoods have taken on an attractiveness and even beauty hitherto unsuspected. In a municipal movement of such widespread interest and importance, and into which so many and varied interests have required to be harmonized, it has been gratifying and encouraging to note the degree of unanimity and good fellowship which has actuated all those who have been associated in it. This has been significant of the general recognition of all parties and organizations of the necessity of stimulating a civic pride which till now has allowed itself to lie dormant, or at the most, to manifest itself only in a few of our more favored suburbs.

In a country in which nature has been so lavish in the infinite variety of her gifts, the tendency in the past has often been to neglect to render her that aid which would have been necessary in a less favored land. It has often been forgotten that the hand of man, whether directed to architecture or agriculture, mars and disfigures rather than embellishes the manifestation of natural beauty. This is the more emphasized in countries abounding in luxuriant and tropical vegetation, among which the efforts of man often stand out in incongruous and unpleasing contrast. In such countries, it is therefore the more necessary that all buildings and permanent works should, as far as is consistent with utility, be constructed in conformity with their surroundings and in harmony with the natural genius of the place.

One universal rule may safely be put in force as the initial step for all improvement clubs. It may be formulated thus: "The first method of beautifying a locality is to put it in order and to cleanse it." In this none can go far wrong. However,

it is essential that those to whom authority has been delegated to act in these matters, be vigilant and jealous lest our country's natural beauties be impaired by such fantastic undertakings as have been voiced of late, and which are not only inconsistent and grotesque, but calculated to render the community which tolerates them a laughing-stock to all lovers of good taste. Without doubt two of the very best suggestions which we have heard have been made by the Catholic and Anglican bishops respectively. The former has advocated the drawing of a large map upon which the general scheme of progress and improvement may be marked out and followed over a period of years, and the latter has cautioned us lest in improving our own city we be misled into attempting to make it resemble any other. These two maxims are worthy of being given full attention. By closely following the former our efforts will not be ephemeral or rendered futile by spasmodic effort, but the line of advance will be steady and harmonious. By observance of the latter we shall take advantage of all the peculiar characteristic natural beauties which surround us, fostering their preservation and development, and vigorously excluding all absurd anachronisms and alien influences, until the name "Hawaii nei" be as a talisman to conjure to all who have visited our fair land a vision of beauty, and simplicity and truth.

In this number there is reproduced a circular recently published by the Division of Forestry, entitled "An Offer of Practical Assistance to Tree Planters."

Following the lines that have become familiar through similar offers of assistance made by the United States Forest Service and by the Forestry Bureaus in several of the States, this circular sets forth just what the Division of Forestry is prepared to do to assist individuals or corporations desiring to establish forest plantations, windbrakes, or to do other forest work.

The present offer is not a new departure, for during the last two years the Division of Forestry has at all times stood ready, so far as means and time have permitted, to respond to like requests. The time has now come when more attention can be paid to this phase of the work, and the circular referred to has accordingly been prepared and widely distributed throughout the Territory. It is hoped that many applications for assistance will result from it.

A PRELIMINARY ACCOUNT OF INSECTS OF ECONOMIC IMPORTANCE IN THE HAWAIIAN ISLANDS.

BY F. W. TERRY.

*Division of Entomology, Hawaiian Sugar Planters' Association
Experiment Station.*

(Continued from Vol. II, p. 73.)

GENERAL REMARKS.

Diptera (True Flies).

This order of insects is a large and well defined one, and many of its members are extremely important economically, since they are directly injurious to man and domestic animals. Every one is familiar with those persistent atoms of annoyance—"mosquitoes"—several species of which are the means of conveying disease and death to thousands, in the form of malaria, elephantiasis or yellow fever, as the recent mortality at New Orleans and the neighborhood has demonstrated. Again immense areas of otherwise valuable pasturage and agricultural areas in Southeast, Central and West Africa, are at present practically closed to settlement and development, owing to the presence of the dreaded "tsetse" flies; these acting as the intermediate hosts of the micro-organism *Trypanosoma*, producing the "nagana" or "sleeping sickness," so fatal to stock and man. Others, too well known, are the Bot-flies, Buffalo-gnats or "Black Fly," Horse-flies, Horn-fly and Screw-worm, all extremely injurious to stock, the larvae of the latter sometimes even causing death in man.

The fruit flies are also a great menace to our fruits, as the Melon fly has proved on these Islands. The Gall-gnats, although extremely small and delicate, are also a formidable group; perhaps the best known of which are the "Hessian fly" and "Wheat midge." Besides this army of markedly injurious flies, there are numbers apparently of little economic importance, although no doubt as our knowledge of these increases, many will be removed from the "unimportant" to the ranks of the "beneficial" or "injurious."

Opposed to this vast army of markedly "injurious" flies is a perhaps larger one of "beneficial" species. Of primary importance are the numerous parasitic flies; these in conjunction with parasitic hymenoptera help to control the myriads of injurious plant-feeding insects, which left to themselves, would soon wipe out vegetation and humanity itself. The "flesh" or "blow-flies" are excellent scavengers, and undoubtedly their larvae are especially beneficial in warm climates, by rapidly converting putrid and offensive animal matter into a less noxious condition.

The larvae of many others are extremely useful owing to their insectivorous habits.

Family *Culicidae* (Mosquitoes).

We are fortunate in possessing but three species of this annoying family, although in suitable localities their numbers more than compensate for the lack of species. The eggs are deposited either singly or in a batch upon the surface or margin of standing water. The larvae and pupae are both aquatic, the former being familiarly known as "wigglers." The males do not bite and can be readily distinguished by their plumed or bottle-brush-like antennae. The habits and life history of the mosquitoes of these Islands have been fully discussed by Van Dine¹, so the following remarks need to be but brief.

Culex fatigans, Wied.

This is the common "night" mosquito. It is destitute of any very definite marks and the legs are unbanded. The general coloring of the body and legs is a light golden-brown. The eggs are deposited in a boat-shaped cluster or raft. According to Theobald² this species has a very wide range, throughout tropical and sub-tropical countries; and appears to be extremely closely allied to the common European (*C. pipiens*) and the North American (*C. pungens*). Van Dine adopts the former name in his bulletin. A recent comparison of *C. pipiens* and *C. fatigans* reveals certain differences which suggest that they are

¹ Van Dine (D. L.) "Mosquitoes in Hawaii." Bulletin No. 6, Haw. Agr. Exp. Station.

² Theobald (F. V.) "Monog. Culicidae of the World," Vol. II, pp. 154-55.

at least distinct races. They are certainly distinct in habit from personal experience, for although *C. pipiens* is very common in England, it practically never bites in that country.

Stegomyia fasciata, Fab.

This is the common "day" mosquito here, and the intermediate host of the yellow fever micro-organism is at once distinguished from *Culex* by the alternately banded dark-brown and white legs. The body is a dark chocolate brown, the thorax bearing a central pair of thin whitish lines and a lateral pair of curved whitish patches. The abdomen also has narrow whitish transverse bands. The eggs are nearly black, and deposited separately, floating horizontally on standing water.

Stegomyia scutellaris, Walk.

This also is a "day" mosquito and at first sight appears to be very similar to *S. fasciata*. It is generally somewhat smaller and much darker, the general coloring being blackish, with a white central line on the thorax; the abdomen is banded with thin white transverse bands. The legs are black with white bands. The eggs closely resemble those of *S. fasciata*.

Family *Chironomidae* (Midges).

The small delicate flies of this group are commonly known as "gnats" or "midges." They are frequently to be observed flying in swarms, over or near water, both in Europe and America. Their larvae are mostly aquatic, many of them being of a brilliant red color, which are known as "blood-worms." One species (*Chironomus hawaiiensis*) is quite common in Honolulu and some of the other Islands. It is a small inconspicuous grey fly, and is often mistaken for a mosquito; the red larvae are at times very abundant in reservoirs and ponds, where they are undoubtedly beneficial, feeding upon minute organisms and decayed vegetation and thus rendering the water purer.

Family *Stratiomyidae* (Soldier-flies).

These are sluggish flies, with flattened bodies and large eyes; one of the commonest species here (*Sargus* sp.) has a metallic-green thorax, the abdomen in the male being dull bluish-black, in

the female bright metallic-blue. The larvae are greyish-buff and flattened with pointed heads, and are frequently found in decaying banana stems.

Family *Dolichopodidae*.

This family of graceful little flies is represented by numerous species on these islands, many of which are native and restricted to the forest region. They are of small size, (the largest being considerably less than a house-fly) and possess long and delicate legs. One species is particularly common. The eyes are large and prominent. The thorax and abdomen are of a metallic golden-green, the wings also possess a delicate iridescence. These flies may often be seen resting on low-growing plants and may sometimes be observed to suddenly rush upon some minute insect, seizing it in their lance-like mouth appendages and sucking the juices.

Very little appears to be known about the larvae, they are stated to live in the earth or decomposing vegetation.

Family *Limnobiidae* (lesser crane-flies).

This family of flies is readily recognized by their slender bodies and very long and slender legs, these very readily becoming detached when handled. The larvae are mostly elongate and inconspicuous in coloring and are frequently found in decaying vegetation. The species on these islands are of no economic importance, and owing to their delicate form they are often mistaken for mosquitoes, but upon examination it will be found that they are utterly devoid of any piercing organs and therefore quite harmless, but since they are frequently confounded with mosquitoes, the above reference has been made to them.

Family *Syrphidae* (hover-flies).

This is a large family, and are popularly known as "hover-flies" from the characteristic habit of hovering in mid-air and then rapidly darting away. They vary greatly in size and coloring, the majority, however, are conspicuously marked with light or yellow bands.

Volucella obesa, Fab.

This fine fly is very common in the gardens around Honolulu and may often be seen poised practically motionless in mid-air, then darting rapidly out of sight. In size it is about equal to that of a honey-bee and stoutly built; the upper surface is of a brilliant metallic bluish-green, the ventral surface having a bright purple sheen.

I have not bred the larva, but it probably feeds in decaying vegetation.

Eristalis punctulatus, Macq.

This common hover-fly somewhat resembles a honey-bee in form and size. The large eyes are of a reddish-brown. The thorax pale buff, with four distinct longitudinal black bands. The abdomen is tawny in the male, with dark transverse bands; in the female these bands are nearly black, and very distinct.

The larvae is aquatic, living in stagnant and foul water, feeding upon stable refuse or decaying vegetation, around which the female flies may frequently be observed depositing masses of the white slender eggs. The whitish larva is maggot-like and semi-translucent, the digestive and other organs being easily visible through the tough skin; it belongs to that type known as "rat-tailed," since it possesses a very long and protusile breathing-tube, which is capable of being extended for nearly two inches; by this means the larva can remain hidden in the submerged mud and continue its respiration unchecked.

Xanthogramma grandicorne, Macq.

This pretty little hover-fly is extremely useful, since its larva is a most voracious devourer of plant lice or aphides. The adult which is about one-half inch in length may frequently be observed hovering over an aphid-infested plant, then with remarkable rapidity she alights on a leaf, deposits a single egg, and is gone, to repeat the process in some other suitable location.

The eyes are large and reddish brown. The thorax a shining steely-blue. The abdomen is a rich yellow with decided black transverse bands.

The eggs are white and the greenish or reddish slug-like larvae are invariably present upon any plant infested with plant

lice. They are extremely voracious, thrusting their small pointed heads amongst the crowded aphides, and sucking these unfortunates dry in an extremely short time.

Family *Pipunculidae*.

These little flies are of considerable economic importance, since the majority of those known, are parasitic upon injurious insects, especially the plant-sucking bugs or leaf-hoppers. There are several species on these islands, some of these are enumerated and described and the habits of the family fully discussed by Perkins.³ They are considerably less than a house fly and black or nearly so, the wings also being dusky, and owing to their very inconspicuous coloration and active flight can be very easily overlooked, as they hover through the low-growing vegetation hunting for their prey. Generally the fully-fed larvae leave their moribund hosts and pupate in the ground.

Family *Tachinidae*.

This family is an extremely important one since all its members are parasites, and destroy an immense number of injurious insects of all orders. Although some are large and conspicuous, they are extremely difficult to classify, and very few of those existing on these islands have been identified. One of the largest and most common is a member of the genus *Chaetogaedia*. This is a large grey fly, with several stiff bristles distributed over its thorax and abdomen. The head is large and wide.

The larva is a whitish maggot which is parasitic on numerous species of cut-worms and other moth larvae, both introduced and native.

Family *Sarcophagidae* (Flesh-flies).

This family includes some extremely useful scavengers, commonly known as "flesh-flies"; the larvae feeding upon any decaying animal matter.

The common species of *Sarcophaga* on these islands are large grey flies, with dark longitudinal stripes on the thorax, and dark checkered markings on the abdomen. Some species are vivi-

³ Perkins (R. C. L.), "Leaf-hoppers and their Enemies," Bull. No. 1, pt. IV. (Div. Entom.) Haw. Sugar Planters' Exp. Stat.

parous, the females depositing larvae instead of eggs; these larvae commence feeding immediately, and rapidly convert the noxious material into a condition rendering it more suitable for plant assimilation.

Family *Muscidæ*.

This family includes many scavengers also, and such well-known forms as house-flies and blow-flies. The larvae vary somewhat in habits, but the majority feed in animal and vegetable refuse.

Musca domestica, Linn. (House Fly).

The term "house-fly" has become a household word, and so well-known are these insects that even a brief description is superfluous. Undoubtedly, owing to its promiscuous habits of feeding, this fly is a very important medium for the transportation of numerous disease-producing micro-organisms. The larvae are whitish pointed-headed maggots and appear to feed very generally in stable-refuse.

Stomoxys calcitrans, Linn. (Stable Fly).

This small brown fly causes considerable annoyance to stock and superficially resembles the house-fly, but upon closer inspection it will be found to possess a well-developed set of piercing mouth organs differing very considerably from the harmless retractible sucking tube of the latter insect. The larvae are small yellowish-white maggots and feed in horse ordure.

Haematobia serrata, Rob-Desv. (Horn-fly).

This little greyish-brown fly is extremely injurious to cattle, swarming at times upon the unfortunate beasts, which become weakened by loss of blood and the constant annoyance and sores caused by their attacks. Its presence on these islands appears to have been first recorded in 1899.⁴

The larvae are of a bright yellow and about one-third inch in length, very pointed at the head extremity. These together with the reddish hard egg-like pupae may be found in cow ordure, the

⁴ Rep. Minister Interior, Haw., for 1898, p. 80.

eggs being deposited there by the female fly soon after it leaves the cow.

Two hymenopterous parasites are known to attack it on these islands.

Various spraying solutions have been tried to render the infested cattle immune to attack, but the relief obtained even when an application is possible is of a very temporary nature.

Apparently from various reported experiments one of the most effective compositions consists of train-oil with a small percentage of sulphur or carbolic acid added, this rendering an immunity of five to six days. Fish-oil, coal-tar and kerosene emulsion are also recommended.⁵

An ingenious fly-trap has been tried, with apparently satisfactory results. It is described as follows: "The device is described as a structure 6 feet high and 4 feet wide, fitting closely in a stable door. On the outer side is hung a curtain, while the inner side, next to the door-way, is composed of broom corn extending from the top downward and from each side toward the center, so that the cow in going through is brushed over every part of the body, while the elastic broom corn, springing back into place, prevents the flies from following her into the stable. The roof of the structure is of wire netting, in which is a trap which the flies can enter but cannot leave. In use the cow is driven into the pen, the curtain let down behind her, and as she passes into the stable the broom-corn brush sweeps off the flies, which by a shake of the curtain are sent up into the trap. The editor of the Canadian Live Stock Journal, according to the press account, saw twenty-eight cows put through this contrivance in twenty-eight minutes, including the placing of the device at three barn doors."⁶ The application of this or a similar type of trap seems quite practical, where the stock are housed daily, but I am not aware of the attempt having been made on these islands.

Family *Oestridae* (Bot and Warble flies).

These flies are serious pests to stock. The larvae live within the digestive tract and frontal sinus, or enter beneath the skin causing large sores and often rendering the hides practically valueless.

⁵ Insect Life, Vol. II, pp. 102-103.

⁶ Insect Life, Vol. VII, pp. 425-426.

Gastrophilus equi, Fab. (Common Horse Bot).

This fly is common at certain seasons around stables and on horse ranches, where they may be observed darting at the flanks, legs or mane of the animal. Aided by the pointed abdomen they deposit their eggs thereon, each of which are securely attached to a hair. These yellowish-white eggs contain larvae, which are licked up by the unfortunate animal and thus conveyed into the esophageal tract, whence they travel into the stomach, sometimes occurring in such numbers as to cause the death of the host. Upon passing from the horse the fully-fed larvae (which are about three-quarters inch in length) pupate either in the manure or earth.

The adult is somewhat bee-like in size and form, of a tawny-brown color with dark patches on the thorax and abdomen, the whole body being densely covered with short fine hair. The wings are yellowish with darker patches.

One practical remedial measure has suggested itself to many, that is, to scrape (or shave) off with a sharp knife the eggs; this should be repeated at frequent intervals (three or four days) during the egg-laying period.

Oestrus ovis, Linn. (Sheep Bot or Head Maggot).

This fly appears to be present on the sheep ranches here, although personally the writer has not seen it.

The eggs are deposited in the nostrils of the sheep, the larvae soon hatch, travelling up the nasal passages and entering the frontal sinuses, where they remain until attaining maturity; they then descend via the nasal passages and pupate in the soil.

The adult insect is similar in general appearance to that of the horse-bot, but greyer and much smaller.

Hypoderma sp.? (The Ox Bot or Warble).

To what extent warbles occur on these islands I do not know, but they are certainly present. The species obtained has not been definitely identified. These flies are bee-like and hairy, bearing a general resemblance to the horse bot; the coloring of the body, however, differs from the former insect. The head and thorax being covered with rich golden brown hairs, the abdomen

is black with grey hairs, except a middle transverse band which is naked. The wings are dull and devoid of any markings.

The eggs of this genus appear to be attached to the hair in a similar manner to those of *Gastrophilus*, but usually several are placed on a single hair. Some diversity of opinion appears to exist as to how the larvae enter beneath the skin. Dr. Cooper Curtice⁷ concludes that the young larvae are licked into the oesophageal tract by the host, the walls of which they pierce, travelling along the muscle tissue until they arrive beneath the skin of the back; this they proceed to pierce, producing a cyst or "warble," and feed upon the purulent matter caused by the inflammation which is set up; finally they leave the cyst and entering the soil pupate.

Family *Trypetidae*.

This family includes many very beautiful little flies, one very general characteristic being the striking ornamentation of the wings. They are mostly injurious, the larvae feeding in fruits, or forming swellings or "galls" in the flowers or stems of various plants.

Dacus curcurbitae, Coq. (Melon Fly).

This serious pest is as far as at present known the only important member of that dangerous family, the "fruit-flies," which we possess. Since its arrival it has practically stopped the raising of melons, cucumbers, squashes and tomatoes in many localities, unless these plants are carefully screened from the attacks of the fly. Besides the above-mentioned, various other fruits of curcurbitaceous, solanaceous and also leguminous plants are attacked. The female fly deposits her eggs either in the tender shoots or young fruit, these soon hatch and develop rapidly, converting the attacked areas into a putrescent condition. This pest was first recorded from these islands in 1901.⁸

The adult insect is rather larger than a house fly, and very wasp-like in form, possessing a decided waist-like contraction between the abdomen and thorax. The general coloring is a pale brown, with yellow patches and bands on the abdomen and

⁷ Insect Life, Vol. IV, pp. 304-10.

⁸ Koebele, Rep. Commsr. Agr. and For., Hawaii, for 1900, p. 39.

thorax. The wings are large and glassy with small brown patches near and at the tips; they are usually held at right angles to the body when the fly is at rest (a position characteristic of this group).

The larvae are of the typical fly-maggot form, about one-third of an inch long and yellowish; they leave the plant to pupate in the ground. They are capable of leaping quite a distance, this action being caused by the curvature and then sudden release of the tension of the body.

FARMERS' INSTITUTE ANNUAL MEETING.

At the annual meeting of the Farmers' Institute on February 3rd, the question of the formation of a Produce Exchange to facilitate the marketing of the products of the soil grown in these Islands, and to thus give an impetus of the most practical kind to diversified agriculture, was taken up and received very favorable consideration. The subject will be considered by the Board of Directors of the Institute, and it is expected that material results will soon come from this consideration.

The first session of the annual meeting was held February 2nd, afternoon, at Kamehameha School, and the following officers were elected to serve for the ensuing year: Jared Smith, president; Wm. Weinrich, Jr., vice-president; F. G. Krauss, secretary-treasurer, and W. W. Hall, Alexander Craw and Prof. P. L. Horne, directors.

Following the election of officers there was a demonstration of manufacture and spraying with koresene emulsion to kill scale and bugs on plants, conducted by D. L. Van Dine, and a like demonstration of the manufacture and use of the Bordeaux Mixture for killing fungus growths, conducted by J. E. Higgins. Following this, the members of the Institute inspected the stock farm and dairy and gardens of the Kamehameha Schools, finding much to interest them there.

EVENING SESSION.

The evening session of the Institute, to which the public were invited, was held in one of the Kamehameha school rooms and was attended by many persons who are interested in agriculture.

The meeting opened with some excellent music by the Kamehameha Boys' Glee and Mandolin Clubs, after which Principal Horne welcomed the Institute and those present to the schools, speaking of the increased interest that had been shown in scientific farming in the last decade, and of the work that the Farmers' Institute had already done for Hawaii. He spoke, also, of the work being done at Kamehameha in the way of farming, spoke of it proudly because from that work substantial results had come. He said that an apiary would be added to the school's possessions this year, that it already possessed a splendidly stocked dairy and the model piggery on the Islands.

PRESIDENT SMITH'S RESPONSE.

Speaking in response to the address of welcome, and delivering his annual address, President Jared Smith said:

The year 1905 has been a very successful one for the Farmers' Institute of Hawaii. I have been pleased to note a constantly increasing interest on the side of agriculture for which this organization stands—diversification as opposed to, or in contrast with, a one-sided industry. There is undoubtedly now greater confidence in the ability of our people to produce from the land a variety of products. We are beginning to see the possibilities of great things coming out of minor industries.

In other words, I note on every hand a willingness to help when the question of trying to do impossible things comes to the front. This change in sentiment, a sort of conversion from the position of opposition to one of tolerance, if not of active assistance, is a most striking feature of the year's progress. Four years ago, when the Farmers' Institute made its first beginning, to dub a man a "small farmer" was no compliment. I note today general sympathy with the movement, and a change of front on the part of many people and interests who, when I came here to establish an experiment station five years ago, were, at least, passively hostile to this innovation.

For this change of attitude the Farmers' Institute and other similar organizations, such as the Hilo Agricultural Society, the Live Stock Breeders' Association, the Poultrymen's Association, are largely responsible.

Increase in the membership of this Institute and increase in the number of organizations formed along collateral lines, indi-

cate a constant widening of the field. Within another five years I hope to see flourishing societies on every island of the group devoted to the interests of bee-keeping, coffee, tobacco, pineapples, bananas, vanilla, sisal, cotton, grapes, as well as marketing associations to bring more intimately together those whose interests should be in common.

It is the aim of the Farmers' Institute to supply a common ground on which both scientist and farmer can stand, each to learn from the other.

Most scientific men lack practical experience, and many farmers lack scientific knowledge. Each have their theories. Keep the two apart and the theories are liable to run to seed, which when planted produce strange products. I often think that the scientist gets more from the farmer than he ever gives. Most farmers will agree with me on this point. This Institute is intended to be a common battleground, where every man can speak his mind. We are all working for the same end—the betterment of the conditions of life, and whatever tends toward increase of the prosperity and general affairs of Hawaii. I sincerely hope that good things accomplished in 1905 will be far overshadowed by the achievements of 1906.

Secretary Krauss then read the following letter from the Delegate in Congress, which, it was explained, should have come up at the afternoon business session:

January 4, 1906.

The Farmers' Institute, Honolulu, Hawaii.

Dear Sirs:—Desiring to further all proper efforts for the diversification of the industries of our Territory, I have had a consultation with Secretary James Wilson of the Department of Agriculture, in regard to securing soil surveys of at least a part of each island in the group.

The Secretary has promised to give favorable consideration to the subject, and added that if he decided that he could extend this work to Hawaii, he would also follow it up by sending a tobacco expert to assist in establishing that industry.

I accordingly have the honor to request that your organization draft and forward to the Secretary of Agriculture a formal request or petition, asking that soil surveys be made in the Territory of Hawaii, and that a tobacco expert be assigned to make a

special study of our local conditions and assist in getting the tobacco industry established on a sound basis.

Hoping that you may send such resolutions to Secretary Wilson by an early steamer, I am, very truly yours,

J. KALANIANA'OLE,
Delegate to Congress.

USE OF AGRICULTURAL COLLEGES.

Prof. U. Thompson was then introduced, and read the following paper on "The Use of Agricultural Colleges":

The Agricultural Colleges belong to the people, and the people should use them as freely as they use their horses or their farms. If you ask how these colleges can be used, I can at least tell how some people are using them. And no doubt, other ways will be developed, as the people realize their value.

The first way is for young men and women to go to these colleges and take the course in agriculture. While East, I heard of two cases that will serve as illustrations. A farmer in Central New York was in debt for his farm. He had toiled long hours each day for years; but the mortgage was immovable. When the son has grown to young manhood, he decided to take a course in agriculture at Cornell. The father supplied him with money, which increased the mortgage, and the son worked extra time at college for additional funds to pay his expenses. He spent his vacations at home working reforms in the way of fruit growing and better dairy stock and methods. When he had completed his course, he returned to the farm and took the helm. In three years he cleared the farm of the mortgage.

The second case was of another farmer who was even more unfortunate than the farmer already mentioned, for, work as he would, the mortgage grew, year by year. When he died the farm was sold to satisfy the mortgagee. There was a small amount left over. The daughter took this money and went to Cornell. She worked extra time for money to help pay her expenses and finally graduated from the Agricultural Department. Then she rented the farm her father had lost and began fruit growing. Today she owns the farm.

These are only isolated cases. But throughout the country you see results of like training in orchards and stock and production. You hear much about scientific farming, but can not

help realizing that with most of the older farmers, these terms mean very little. You also realize that the younger farmers appreciate what is being done at the Experiment Stations; and many of the boys will know what the Agricultural Colleges are doing,—what scientific farming really means.

Second—Farmers can use the Agricultural Colleges by sending problems directly to the professor interested. The California farmers are using the Agricultural Department of their university, for all it is worth. Hundreds of soil specimens are sent in to be analyzed,—so many specimens that the old methods of analyzing soils had to be abandoned, and a short method is now in use, by which a chemist can determine from 8 to 12 specimens a day, with sufficient accuracy for all practical purposes. Pests of all kinds swarm about the entomologist; seeds that won't grow and seeds that are not pure find their way to the seed specialist; and when crops fail to be produced in sufficient quantities to satisfy the farmer, he invites the agriculturist to come and see what the matter is. And the agriculturist goes. Not simply because he is a servant of the state, but because he is interested in whatever interests the farmer. The experts are kept alive and progressive. Dr. Hilgard says that when he has a problem he can't solve, he goes to the farmer. The farmer has the facts which Dr. Hilgard with his trained mind can put together and make science of. The farmer of today may not get relief in all his problems; but he gets enough relief to keep hope alive in the children, and the grandchildren will reap the benefit from the questions the farmers of today are asking the scientists.

Third—The people can use the Agricultural Colleges, through the Experiment Stations, through the new Industrial High Schools that are being developed, through the nature study that is growing in importance, and through the model farms that are coming. The Agricultural Colleges will train a vast army of young men and women for work in the Experiment Stations, in the Industrial High Schools, in nature study and for the model farms.

The work of the Experiment Stations is so well known that I need not say anything about them.

The Industrial High Schools are of so recent development that I venture some explanation. These schools are located in the country, and in the villages and country towns. They are in response to a demand from the farmers. There will be class-room

work and laboratory work, shop work and farm work. The courses will lead to the professions, to business, the sciences, the trades and to the farms. In short, these schools are intended to do for each industry what the Manual Training High Schools are doing for the trades.

There is a growing appreciation of elementary work in the sciences, nature study, some call it, and a demand for trained teachers to do this work as it should be done. The Chicago Normal School has just arranged for training teachers for this work, on a new basis which probably puts it in the lead of other institutions. Now comes the question as to whether the Agricultural Colleges will long permit a normal school graduate to rank higher than the college graduates.

I found the United States Agricultural Experiment Station men very sensitive about model farms. But I am willing to risk my reputation as a prophet on the statement that the model farm will be the next step in agricultural development. And here are my reasons: A large percentage of farmers can not translate the college bulletins and the experiment station bulletins into farm language and farm practice. This must be done for them. And the place where it is done will be the model farm. And if agriculture continues to develop as we hope to see it develop, the model farm will continue to be an advantage even to the college-bred men, just as a hospital is an advantage to physicians who wish to keep abreast of their profession. The business of the agricultural college should be to develop the science of agriculture and so it will always be in advance of the agricultural stations. And the stations will always be in advance of the model farm. And the model farm will be in advance of the great majority of the farmers, translating the work of the colleges and stations into farm practice.

The day for individual effort is almost gone. No greater misfortune, not even the misfortunes of war, has come to the human race than that of individual effort, and this is especially true in agriculture. Through the ages each farmer has been obliged to fight his own battles with pests and soil and climate conditions. What waste of wealth this system has wrought. What waste of energy it has caused. What slavery it has entailed on successive generations. What desertions from the land it is responsible for. What congested misery in cities it has produced. No, the day

for individual effort is fast passing away. Collective effort is the new order.

In concentration of capital and labor and management, and in commercial botany, entomology, chemistry and cultivation of the soil the planters of these Islands have set an example for the world. What the planters' experiment station is to the individual planter, the model farm will be to the small farmer. All classes of men are interested, whether they know it or not. Greater production and better products mean as much to the business man and the professional man as to the farmer. It is simply a matter of all men knowing this on the one hand, and that the agricultural colleges are the source from which must come the science of agriculture on the other hand; and then all men will demand more agricultural colleges, better equipment for them, and fuller service from them.

This all men are learning with an intensity of purpose that no thoughtful man can misunderstand or fail to appreciate.

SISAL AND ITS PRODUCTS.

Mr. Wm. Weinrich, Jr., then delivered a most interesting lecture on sisal and other commercial fibres, showing samples of the products from various parts of the world. Mr. Weinrich began his address with a short sketch of the history of sisal. The plant was introduced from Yucatan, where it first came into use, to Florida in 1836, and from Florida was brought to the Hawaiian Islands in 1893. A peculiar difference, as shown by the speaker's samples of the plant, was that the sisal from Yucatan was spiney along the edges, and of smaller leaf than the Hawaiian. This gave the island product the double advantage that it was easier to handle, so that laborers could work in it with less trouble, and it had also a longer fibre, which increased its commercial value. On the other hand, the life of the Hawaiian plant was only from eight to ten years, while the Yucatan lives from sixteen to twenty.

Mr. Weinrich said that he was now engaged, with the great Burbank, in an effort to produce a longer-lived sisal with the advantages of the Hawaiian product as to lack of spines and the longer leaf. He said it was remarkable, in this connection, that all the young plants had the spines on the edges, but that in Hawaii these disappeared as they grew older.

Continuing his address, Mr. Weinrich corrected a popular error

by saying that it was not true that stoney and arid lands were best adapted for the growth of sisal. On the contrary, while sisal would grow and thrive on stoney and arid lands, it grew and thrived better on rich lands that were better watered. The object was to produce a long, clean, white fibre, with some strength. That was what the cordage men wanted. The sisal grown on the richer lands, with more rainfall, gave the longer, cleaner and whiter fibre.

fibre. And Mr. Weinrich showed samples to prove what he said.

The long leaf varieties were better, because they not only produced a longer fibre, but took no more labor in handling than the short leaf kinds. As to the planting, experiments at the plantation at Sisal have convinced him that it was better to set the plants about nine feet apart each way.

Mr. Weinrich explained the process of getting the sisal fibre from the leaf by machinery, and showed samples of rope and paper and mattress stuffing made from sisal, the paper and mattress stuffing being from the waste that the decorticating machine did not save. He said that the best fibre was made from sisal by hand, and that in Yucatan hammocks made from this class of fibre sold for their weight in silver. The people of Yucatan, however, were very jealous of their industry, and it was almost impossible to get plants from them. They would scald them before shipment, so that they would not grow. Heat was the greatest enemy the sisal had. Here in Hawaii there were no pests that harmed it, although they had a beetle in Yucatan that killed the plants. The speaker explained the remarkable fecundity of the sisal, one plant producing between 2000 and 3000 young ones from its bloom stock, besides any number of suckers each year.

In conclusion, Mr. Weinrich exhibited a number of fibres from the agave americana, and the sansiveria, which latter would produce a fabric as fine as the celebrated pina cloth of Manila. He showed samples also of Manila hemp fibre, and fibres of divers sorts from all parts of the world, demonstrating that there was room in Hawaii for the development of a most important industry.

An interesting general discussion followed his paper, and the Institute then adjourned.

NOTES FROM THE DIVISION OF ENTOMOLOGY OF
THE BOARD OF AGRICULTURE AND FORESTRY.

BY JACOB KOTINSKY.

I was very much interested in the letter of Dr. Walter H. Evans, in the January (1906) number, relative to the "green-bug" (*Coccus viridis*) on lemon trees in Hawaii. It is interesting to note that the learned Doctor bases his criticism upon a newspaper clipping. Through an oversight the newspaper representative was not supplied with a copy of the report as read before the Board, and as a result there is considerable discrepancy between the newspaper report and that given in the December (1905) "Forester." But Dr. Evans is evidently not entomologist enough to have realized that the green scale does not attack vanilla; it is not surprising therefore that he did not realize the other inaccuracies of the newspaper story.

The facts of the case are clearly set forth in the report as published in the December number of the "Forester." That report, however, does not contain specific references to or quotations from Part III of "Coccidæ of Ceylon," published by Mr. E. Ernest Green, the Government Entomologist of Ceylon, and author of the species of scale insect in question, upon which the statements concerning the relation of the "green-bug" to coffee in Ceylon were based. These were not deemed necessary to include in the published report. It is surprising though that Dr. Evans, who seems to have made an effort to include references to all authorities on the subject, should have omitted quoting this eminent authority, who is one of the best living authorities on scale insects, and who has made a thorough first hand study of the insect in the field. Was the omission due to oversight or convenience? It is a notable fact that in the work referred to, issued in 1904 and written in 1903, Mr. Green devotes four pages to *Coccus viridis*, nearly three of which consider its economic aspect, while an average of not more than one page is allotted to each of the other species treated, and there are thirty-two of them. This is what the author says of the "green-bug":**

** Coccidæ of Ceylon, Pt. III, pp. 200-203.

"Habitat.—Originally noticed on coffee (both Libernian and Arabian), but now almost omnivorous. Some of the better known plants upon which it occurs are: *Cinchona succirubra* and *officinalis*, *Citrus* (various species), Tea (occasionally), *Psidium guyava*, ('guava'), *Manihot scara*, *M. Para*, ('para rubber'), *M. utilissima*, ('tapioca'), *Gardenia*, *Ixora*, *Plumiera*, and numerous garden shrubs. Amongst indigenous plants, *Antidesma bunius*, *Hiptage madablota*, *Callicarpa lanata*, *Moesa indica*, and several species of *Loranthus*, may be mentioned. The insects, in all stages, are crowded on—usually the under surface of—the leaves and on the young shoots of the plants, more frequently along the mid-rib and veins.

"'Green-bug' has proved such a scourge in Ceylon, being *practically responsible for the final abandonment of coffee cultivation over the greater part of the planting districts*,* that a short account of its origin and ravages must be added to the bare description given above.

"*Lecanium viride*, popularly termed "Green-bug," first attracted attention in Ceylon in the year 1882, when it was already doing considerable damage to coffee in the Matale district. The pest rapidly extended its area, and spread through all the districts of the Central Province within three years. In 1886 it completed its conquest by appearing in the Badulla district of the Province of Uva.

"The bug attacks with indifference both vigorous and weakly trees, but its effect is markedly different in the two cases; for, though leaves of robust trees become thickly infested by the insects, and blackened by the consequent fungus, they do not fall off, but the plant continues to make fresh growth and retains a fairly healthy appearance. Weakly trees, on the contrary, are almost completely denuded, none but the two or three terminal leaves on each twig remaining. The shoots become dry and hide-bound, and no fresh wood is formed. Naturally such a condition results in a total loss of crop.

"Unfortunately, at the time of the invasion, our coffee had been weakened by long-continued attacks of 'leaf disease' (*Hemileia vastatrix*), Moreover, the prevailing system of cultivation resulted in the loss of the surface soil, so essential to the health of the coffee plant, in all but the most favored situations. The

* The italics are mine.

further tax upon its strength induced by these myriads of sap-sucking insects proved too great for the plant, with the result that thousands of acres of coffee land were abandoned or replaced by tea. Some idea of the collapse of the coffee industry may be obtained by comparing the annual export of coffee during the period of attack. In 1881, 452,000 cwts. were shipped from Ceylon. In 1891 this figure had fallen to 88,780 cwts. While, during the past year (1902), the total scarcely exceeded 10,000 cwts.

"It must not be supposed that no efforts were made to check the invasion. When the pest first appeared on any estate, individual plants and small patches of affected trees were frequently cut out and burned. But nothing stayed the progress of the invader. The fact is, the insect being an inconspicuous one, by reason of its color and small size, it was not noticed until it had established itself in sufficient force to defy all efforts at extermination. All the old remedies that had obtained a (usually spurious) reputation as effective against the old brown bug were tried without success. Affected trees were swathed in freshly cut 'Mana grass' (*Andropogon nardus*). They were dusted with dry lime and wood ashes. But all to no effect. Following out some previous experiments with coal-tar applied to the roots, the writer applied dilute phenol and carbolic powder to the soil below the trees. The former application was at first thought to have proved successful (see Report on Green Scale Bug, 1886, footnote to page 3). But subsequent and more extensive experiments, carried out in the same way, negated the earlier result. The original experiment was on too small a scale to provide a proper test. Lime and water, applied as a thin whitewash, by hand, killed every bug with which it came in contact; but it was found impossible to apply it in a sufficiently thorough manner, and the process was too costly in labor, when large acreages were to be treated. The same remark applies to all other liquid applications. They were both costly and inefficient. Many fancied cures owed their reputation to the death of insects from natural causes. For, quite from the commencement, the pest had its periods of increase and decrease. These periods vary in different parts of the island according to the prevailing weather. The bug flourishes best during the time of fine weather interspersed with light showers. It objects to extremes, and usually decreases both in the very wet weather and during times of excessive

drought. In districts subject to a heavy southwest monsoon, the pest is at its height from the middle of March to the middle of June, when it is checked by the continuous rains. There is a recrudescence from September to January, when it again decreases during the dryest months. On the other side of Newara Eliya, I am informed that the bug usually appears towards the end of April, and reaches a climax in October or November. If there is any very wet weather in the mean time, it temporarily declines, but flourishes in times of light rain with intermediate sunshine, and disappears almost completely from December to April.

"The periods of decrease are marked by the death of fully 90 per cent. of the insects from an epidemic fungal disease. The scales shrivel and become covered with a greyish-white fungus, which extends as a delicate fringe all round them. Dr. A. Zimmermann, then of the Botanic Gardens, Buitenzorg, Java, described this fungus under the provisional name of *Cephalosporium lecanii* in one of the circulars of his department. Dr. Zimmermann informs me that he has been experimenting with this fungus with a view to obtaining a culture that can be applied as a spray, but I have not yet heard whether success has attended his attempts. In Ceylon the fungus seems to be widely distributed, but depends upon climatic conditions for its proper development. It appears to be readily communicable by direct contagion in Ceylon. But material sent to Mr. Newport, in Southern India, failed to induce the disease in 'Green-bug' there. The weather in India at the time was not favorable for the experiment. I am inclined to think that this grey fungus has been gradually increasing and that its effect in reducing the numbers of the bug is more marked year by year. * * * * *

"From the sudden appearance of the pest and its rapid extension, it is almost certain that the insect is an introduced species, and it seems probable that the Libernian coffee plant may have been the vehicle of introduction. *Lecanium viride* has recently been recorded from Africa by Mr. R. Newstead from Lagos, West Africa. It is true that Mr. Newstead considers that the African insect is a distinct variety, but scarcely sufficient material was examined to establish that fact."

Granting that *Hemileia vastatrix* was principally responsible for the devastation of coffee in Ceylon, it does not follow that *Coccus viridis* could not have accomplished the task unaided. In

view of the facts given by Mr. Green there is every reason to believe that such would have been the case. There seems also some basis to believe that the bug was responsible for the dissemination of the fungus. The two coffee enemies probably aided each other materially. While our *Cercospora coffeicola* does not seem to be as injurious as was *H. vastatrix*, who can tell what its effects would have been when assisted by the "green-bug?" Nor, as stated in my report, is the fungus disease of the bug, referred to by Mr. Green and Dr. Evans, known to exist in Hawaii.

And finally, as to the practicability of kerosene emulsion or any other spray against an enemy of coffee in Hawaii: Had Dr. Evans seen the conditions under which coffee grows in Kona, for example, he would have not ventured to offer the kerosene emulsion remedy. As much coffee grows (wild, uncultivated, I mean) in Kona, as is under rational cultivation. Should the "Green-bug" have gained a foothold in Kona, the most effective wash would have been no more practicable there than in the sugar cane fields against the leaf hopper.

Dr. Evans would have profited either by reading the December (1905) Forester or by consulting an entomologist before writing his opinion.

THE FARMERS' INSTITUTE OF THE TERRITORY OF
HAWAII.

Honolulu, February 17, 1906.

Editor, The Hawaiian Forester and Agriculturist, Honolulu.

Dear Sir:—At a special meeting of the Executive Committee of the Farmers' Institute of Hawaii, on the 13th inst., held to consider our Delegate's suggestions in regard to securing soil surveys of the Hawaiian Islands, and also the services of a tobacco expert to assist in establishing that industry in Hawaii, it was voted that a petition be forwarded to the Hon. Secretary of Agriculture at Washington, requesting that he use his efforts to secure for our Territory, the desired assistance.

Herewith inclosed, please find copy of letter forwarded to Secretary Wilson, by Manchuria as mail, Feb. 14, 1906.

Respectfully,

F. G. KRAUSS,
Secretary Farmers' Institute.

February 15th, 1906.

Hon. James Wilson,
Secretary of Agriculture,
Washington, D. C.

Dear Sir:—Our Delegate to Congress, the Hon. J. K. Kalaianaoale, desiring to further all proper efforts for the improvement and diversification of the industries of our Territory, advises us, under date of January 4th, 1906, of his consultation with you in regard to securing soil surveys of at least a part of each Island in the group.

We are informed that you have promised favorable consideration to the matter, and further, should you decide that this work can be extended to Hawaii, you will follow it up by sending a tobacco expert to establish that industry on a firm basis.

Appreciating the great benefits that would result to Hawaii by such aid from the United States Department of Agriculture, the Farmers' Institute of the Territory of Hawaii respectfully and earnestly petition the Hon. Secretary of Agriculture to use his best efforts to secure for our Territory as complete a soil survey as possible for each of the several Islands forming the Territory of Hawaii, and also to assign a tobacco expert to these Islands to assist in establishing the tobacco industry, in which the Hawaii Experiment Station, with Territorial aid, has already made so favorable a beginning.

Trusting that this petition for the extension of Hawaii's agricultural resources will meet with your favorable consideration, we are,

Respectfully yours,

JARED G. SMITH,
President.

PEARLEY L. HORNE,

ALEXANDER CRAW,

F. G. KRAUSS,

Executive Committee.

REPORTS OF THE SUPERINTENDENT OF ENTOMOLOGY.

Honolulu, T. H., January 17, 1906.

Board of Commissioners of

Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my last report to you on the 4th inst., sixteen steamships and sailing vessels arrived in port from outside the Territory, having on board 2,709 packages of fruits and vegetables and five cases of plants. Twelve packages of mail material were examined. One hundred and forty (140) boxes of apples infested with scale insects were returned to California and six crates of celery was burned as it was attacked by "cut worms."

Ten shipments of oranges (50 cases) from China were destroyed by fire as they were found infested with scale insects and several of the lots with a new species of fungus disease, a sample of which I submitted to Dr. N. A. Cobb, the pathologist of the Hawaiian Sugar Planters' Association, who stated that it was new to him and was a good thing to keep out. He will make a thorough examination when he has an opportunity and report later.

Respectfully submitted,

ALEXANDER CRAW,
Supt. of Entomology and Inspector.

Honolulu, February 7, 1906.
Board of Commissioners of

Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my report of the first two weeks of Janu-

ary I have to report the arrival of fourteen steamships and sailing vessels from outside the Territory.

We found thereon five thousand four hundred and three (5,403) packages of fruits and vegetables, twelve (12) cases, boxes and bales of trees and plants and seven (7) packages by mail.

In my last report to you I should have stated that on January 9th, Mr. George Compere, beneficial insect collector for the State of California, passed through Honolulu on the S. S. "Sierra" from Australia on his way to San Francisco, after having visited the Orient. He was rushed for time, but I made it my duty to drive him through Honolulu and its suburbs, calling his attention to our most serious introduced insect pests, so that should he find either in his future travels he can make a search for their natural checks. In correspondence with Mr. Ellwood Cooper, the Chief of the California Horticultural Commission, he promised to furnish this Board with colonies of parasites of the "purple scale." Mr. Compere requested me to prepare a few orange trees by establishing them in boxes or tubs and thoroughly infesting them with the following scale insects—one species to each tree—"Purple scale" (*Lepidosaphes beckii*), the "Florida red scale" (*Chrysomphalus ficus*) and the "black parlatoria" (*Parlatoria zizyphus*) are all very troublesome upon citrus and various other trees on these Islands and are comparatively harmless to such trees in China. Mr. Compere is now on his way to Southern Europe in quest of beneficial insects for California and afterwards will visit China, when we can forward the infested trees. In this way we will be more successful in introducing the parasites, rather than undertaking their importation on detached branches in cold storage. The growing tree system I successfully used a few years ago in sending internal parasites (*Scutellista cyanea*) from California to Western Australia, after several attempts had been made in the old way by sendings from California and Cape Colony. I specially called his attention to that serious pest, the "Avocado pear scale" (*Pseudococcus nipae*) and hope he may succeed in finding its enemy in his travels.

On January 18th a wardian case of economic plants arrived ex S. S. "Mongolia" from India via Hong Kong, but they were all dead, probably from cold weather encountered on the voyage near Japan. On the same steamer there arrived forty-four (44)

cases of oranges from China and as they are from a district subject to "fruit flies" and excluded from the Territory of Hawaii by your Rules and Regulations, of October 25, 1904, we destroyed them, also the cases by burning.

In my report to you of January 17th I referred to the destruction by fire of fifty (50) cases of oranges from China ex S. S. "Siberia," January 5th, infested with a new fungus, a sample of which I submitted to Dr. N. A. Cobb, Pathologist of the Hawaiian Sugar Planters' Association. He stated "that it was new to him" and "a good thing to keep out." Dr. Cobb was called to the Island of Hawaii to investigate some matters there, so has not yet had an opportunity to report upon the Chinese orange fungus.

On January 27th ex S. S. "Nebraskan" a package arrived per mail containing two lemon trees from Florida infested with "white wax scale" (*Ceroplastes floridensis*). The owner was called to see their condition, after which the trees were burned. Another package by same mail contained a plant of a new salvia upon which I found the scale *Orthesia insignis*. This is the same insect that made its appearance on the lantana on the Island of Maui and afterwards distributed over that and other Islands by the stock men to destroy that plant. The salvia was burned and an official notice sent to the owner.

Respectfully submitted,

ALEXANDER CRAW,
Supt. of Entomology and Inspector.

KEALIA FOREST RESERVE.

In accordance with the established usage of the Board of Agriculture and Forestry, the following resolution and reports in regard to the proposed Kealia Forest Reserve, in the District of Puna, Island of Kauai, are here published. The reports were approved and the resolution adopted at the meeting of the Board held on January 17th, 1906. The matter has now been referred to the Governor with the request that after the public hearing required by law, he issue a proclamation creating the reserve and

setting apart the government lands within the boundary as compartments of the reserve.

RESOLUTION.

IN REGARD TO THE PROPOSED FOREST RESERVE IN THE DISTRICT OF PUNA, ISLAND OF KAUAI.

Adopted by the Board of Commissioners of Agriculture and Forestry at the meeting held on January 17, 1906.

Resolved, That the Forest Reserve on the east side of Kauai, embracing the mauka part of the District of Puna, above a line drawn at approximately the lower edge of the existing forest across the lands of Anahola, Kamalomaloo, Kealia and Kapaa, District of Puna, Island of Kauai, as recommended by the Committee on Forestry, on January 17th, 1906, based upon the report of the Superintendent of Forestry, dated December 30th, 1905, and on a map and description prepared by, and now on file in, the Government Survey Office, be approved.

Resolved, That the Board recommends to the Governor that the Government lands within the boundaries of the proposed Kealia Forest Reserve be set apart by him, after the hearing required by law, as compartments of the Reserve.

Resolved further, That the Board recommends to the Governor that all the land within the said described boundaries be approved by him to be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundaries be requested to co-operate with the Board of Agriculture and Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Jan. 17th, 1906.

To the Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Your Committee on Forestry has had under advisement, the question of the forest reservation on the Government lands of Anahola, Kamalomaloo and Kapaa and the land of Kealia, owned by the Makee Sugar Company.

The Forester has submitted an exhaustive report with his recommendations, including also the description of the proposed reservation. Your Committee have no personal knowledge of the territory proposed to be incorporated in this reservation, but have carefully considered the report above mentioned and do approve the recommendation of the Superintendent of Forestry that this

reserve be made and the Governor be requested, in compliance with the law, to declare the same a forest reserve and set apart the portions thereof owned by the Government for such purpose, and do further approve the recommendations that the Commissioner of Public Lands be requested to make provision for the forest fence where necessary along the lower or makai boundary of the same.

Respectfully submitted,

W. M. GIFFARD,

ALFRED W. CARTER,

Committee on Forestry.

Mr. L. A. Thurston, the third member of the Committee, absent, in California.

REPORT OF THE SUPERINTENDENT OF FORESTRY

December 30, 1905.

Committee on Forestry,

Board of Commissioners of

Agriculture and Forestry,

Honolulu, Oahu.

Gentlemen:—I beg to submit herewith a report with recommendations, upon the proposed Kealia Forest Reserve on Kauai.

In July, 1904, I prepared a preliminary report upon the question of creating a forest reserve in the north end of the Puna and east end of the Koolau Districts, on the Island of Kauai, better described perhaps as embracing the forest lands lying back of the Kealia Plantation. Owing to the fact that certain descriptions were not available no action was then taken on the report, nor has there been since. I am now prepared to submit this as a final report upon the Kealia Forest Reserve. It is based in part upon the information contained in my preliminary report and also upon other data obtained since that time; the whole being largely the outcome of personal examinations made on the ground by me in May and June, 1904, and in June, 1905.

LANDS INCLUDED.

The proposed Kealia Forest Reserve includes portions of the lands of Anahola, Kamalomaloo, Kealia and Kapaa. Of these Kealia belongs in fee simple to the Makee Sugar Company, the

owner of the Kealia Plantation. The others are government lands now under lease to the Makee Sugar Company. On all three of the lands the present leases are within two years of expiration, the dates on which they run out being as follows:

Kamalomaloo, March 29, 1907; Anahola and Kapaa, May 1, 1907. Anahola and Kamalomaloo adjoin one another and lie to the north of Kealia, which separates them from Kapaa. Under the former land classification Anahola and Kapaa were "crown" lands, Kamalomaloo a "government" land.

The area within the forest reserve boundary described below is for the several lands, as follows:

Anahola	}	.....	5051 acres.
Kamalomaloo			
Kealia		.....	2550 "
Kapaa		.....	2334 "
Total			9935 acres.

PURPOSE OF THE RESERVE.

The forest problem in the north end of the Puna District on Kauai is to so protect the natural forest covering the watershed that the water in the streams draining the area may be made to do its full duty through irrigation, in the development of the fertile agricultural land below.

At present use is made of the greater part of the water that can be got out of the streams at an elevation sufficient to permit the irrigation of the cane fields. The water that develops below the water heads, from springs or seepage, with that in the streams, is used on the rice fields and taro lands at the lower levels. Owing to the fact that the several lands mentioned above vary in elevation, it often happens that the water from a given stream can be used to better advantage on other lands than on those naturally tributary to that stream. For example, under the present arrangement the Anahola water is in part used for irrigating Kealia fields, which part of the Kealia water goes to Anahola.

Experience has shown the best paying crops that can be got from the lower lands on the east side of Kauai, to be sugar cane and rice. Up to now the sugar lands have been handled by a single corporation. In future their disposition may be different, but whatever may be the outcome of the present plans for settle-

ment, there will remain the need for an adequate and assured supply of water for irrigation.

The object of the proposed Kealia Forest Reserve is by protecting the forest on the mountain slopes and in the upper valleys of the watershed, to assist in maintaining the present desirable conditions of regular flow in the streams and the retention of at least a part of the storm water.

TOPOGRAPHY.

For the most part the area within the boundary of the reserve is of such rugged and broken topography that its use for anything but forest is out of the question. And the few places within the boundary where there are flats, as for example the area just within the forest line on the land of Kamalomaloo, are not suited for agriculture. On this particular plot the soil is cold and sour, making it unfit even for grazing land. This area is chiefly of value as containing several reservoir sites, one of which has been purchased by the plantation and developed by the erection of a substantial dam.

On this and the few other similar areas and on the bare ridges on the land of Kealia, certain kinds of trees might however be grown, from which, it is believed, better returns could be got than from any other use to which these areas could be put. The afforestation of such places would in time provide a source of wood for various purposes, including fuel, a need that will be strongly felt with a growing population on the lands below. The exclusion from the reserve of all land rightly to be classed as agricultural has been kept constantly in mind in drawing the boundary, consequently the reserve includes only forest land.

THE FOREST.

The forest in the Kealia Reserve is of the type common on the lower mountains of the Territory—a dense stand in which Koa (*Acacia Koa*) and Ohia Lehua (*Metrosideros polymorpha*) predominate, in mixture with a considerable number of other species. Under the canopy of the trees are various vines, creepers and other undergrowth, while the forest floor itself is covered with a dense mat of brakes, ferns and mosses, the whole so interwoven as to be almost impenetrable, except as one cuts his way

through with a cane knife. It would be hard to imagine a cover of vegetation better adapted for the conservation of water than this. It is indeed, for this climate, the ideal protection forest.

BOUNDARY RECOMMENDED.

Following and as a part of the examination made by me to determine the location of the forest line and to study the local conditions on the ground, I have discussed the matter with Mr. J. W. Pratt, Commissioner of Public Lands; with representatives of the Kealia Plantation, including Col. Z. S. Spaulding and Mr. G. H. Fairchild, the latter being also the local district forester, and with Mr. F. E. Harvey, of the Survey Office, who from investigations incident to comprehensive surveys of the government lands in northeastern Kauai, has become very familiar with the lands and general conditions obtaining in this section. As a result of this study the lower boundary of the Kealia Reserve was laid out on the ground by Mr. Harvey, under my direction, the important points along its course being marked by him. As stated above, this line was run with the idea of excluding all land suited for agricultural use. Its location has been approved by the Land Commissioner.

Briefly, the lower boundary of the Kealia Forest Reserve may be described as follows: Beginning at a point on the Aliomanu-Anahola boundary at the end of the Kolau Ridge, the line skirts the foot of the bluff, follows up the Anahola River to a point near the concrete dam and waterhead, thence up the bank and across the lands of Anahola and Kamalomaloo a little below the edge of the existing forest to the hill in Kealia called Puu Kinui, thence to Puu Lawaii, crossing the Mimino Gulch near the new (1905) dam and reservoir, thence following the foot of the steep slope on the north side of the Kapahi stream to the Moalepe gulch to a point near a place called Pohakuiki, thence to and following the ridge forming the Kapaa-Waipouli boundary into the mountains.

The upper line of the reserve follows the ridges which make the main divides between the watersheds on the north and east sides of the island, it being part of the way identical with the mauka boundary of the Halelea Forest Reserve, proclaimed in August, 1904.

The location of the proposed boundary of the Kealia Forest Re-

serve is shown on the accompanying sketch map, but the official maps of this reserve boundary are the large maps of Kapaa and Anahola and Kamalomaloo prepared by Mr. F. E. Harvey, on file in the office of the Territorial Surveyor, respectively Registered Maps Nos. 2324 and 2282.

The detailed description of the line prepared by Mr. Harvey is attached hereto and forms a part of this report. Especial attention is called to the elevations which are given for all the principal points along the line.

ADDITIONS TO THE RESERVE.

It may perhaps be noted here that it is my intention later to recommend the extension of the Kealia Reserve to join and include the area of forest which has for some years been maintained under fence as a private forest reserve by the Lihue Plantation Company. The fence of the Lihue Reserve now extends from a point near Kilohana crater on the land of Hanamaulu, to Hana-hanapuni hill on Wailua. This forest line should be continued across the lands of Wailua (government) and Olohena and Wai-pouli (fee simple) to the point called Kainamanu on the boundary of the Kealia Reserve, described by Mr. Harvey. Before the exact location of this line can be recommended further study on the ground will be necessary and a more accurate description of the line than is now at hand.

RECOMMENDATIONS.

For the reasons above set forth, I recommend that the Board of Commissioners of Agriculture and Forestry approve the Kealia Forest Reserve as described in this report and request the Governor, after the required hearing, to declare and recommend by proclamation, in accordance with law, the area herein described as a forest reserve, and to set apart as portions thereof the government lands embraced within the reserve boundary, to-wit: Anahola and Kamalomaloo, 5051 acres, and Kapaa, 2334 acres.

I recommend that the Commissioner of Public Lands be requested to make provision for the building and maintenance of a forest fence, where necessary, along the lower reserve boundary, by the insertion of fencing clauses when the lower portions of the above named lands are again leased.

I further recommend that steps be taken to secure the co-

operation of the Makee Sugar Company, that the portion of Kealia lying within the reserve may be administered with the other lands to the best interests of the reserve as a whole.

OFFICIAL DESCRIPTION OF THE BOUNDARY.

Following is the technical description of the boundary of the Kealia Forest Reserve, prepared by Mr. F. E. Harvey of the Government Survey:

[The technical description of the boundary is here omitted, as it is somewhat lengthy and will be published later in this magazine as a part of the proclamation creating the reserve.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

EWA FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on February 7, 1906, the reports of the Committee on Forestry and of the Superintendent of Forestry on the proposed Ewa Forest Reserve on Oahu, were approved, and a resolution in regard thereto adopted. Following the usage of the Board the resolution and reports are published herewith:

RESOLUTION.

IN REGARD TO THE PROPOSED EWA FOREST RESERVE.

Adopted by the Board of Commissioners of Agriculture and Forestry on February 7, 1906.

Resolved, That all of those certain lands in the Ewa Basin, on the Island of Oahu, bounded on the southwest by approximately the lower edge of the existing forest, on the northeast by the crest of the Koolau Mountains, on the east by and including the land of Halawa, District of Ewa, and on the west by and including the land of Wahiawa, in the District of Waialua, as recommended by the Committee on Forestry, on February 5th, 1906, based upon the report of the Superintendent of Forestry, dated January 16th, as more particularly appears by and on a map and description now on file in the office of this Board, and made a part

hereof, be approved as a forest reserve, to be called the "Ewa Forest Reserve."

Resolved, That the Board recommends to the Governor that the Government lands within the boundaries of the said proposed Ewa Forest Reserve be set apart by him, after the hearing required by law, as compartments of the said Reserve.

Resolved further, That the Board recommends to the Governor that all the lands within the said described boundaries be approved by him to be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundaries be requested to co-operate with the Board of Agriculture and Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Feb. 5, 1906.

Board of Agriculture and Forestry,

Honolulu T. H.

Gentlemen:—Your Committee on Forestry have received from Mr. R. S. Hosmer, Superintendent of Forestry, a report upon a proposed forest reserve along the west slope of the Koolau Range, extending from the boundary of the Honolulu District to and including the land of Wahiawa, on the Island of Oahu.

The proposed reserve lies entirely within the Ewa District except two lands, Waianae-uka, which is in the District of Waianae, and Wahiawa, which is in the District of Waialua.

The mauka boundary is the crest of the Koolau Range of mountains and the makai boundary is a line drawn along approximately the present lower edge of the forest and ranging from an approximate elevation above sea level of from 800 to 1000 feet.

The total area of the proposed reserve is approximately 28,550 acres, of which approximately 4,759 acres is government land not now under lease and available for immediate segregation as a forest reserve.

With very limited exceptions the land lying above the forest line is so broken with deep gulches with almost precipitous sides, that the land is unavailable for agricultural purposes and of but little value for pasturage purposes. Even if the land proposed to be reserved were much better suited for cultivation and pasturage than it is, your Committee are of the opinion that it would be wise economy to reserve it for forest purposes, as the lands lying

in the Ewa Basin are of value almost solely by reason of the water which originates in the area proposed to be reserved.

The present annual output of sugar from the district, which depends upon this water shed for almost its entire water supply, is approximately \$6,000,000. The sugar cane is raised in the district referred to only up to an elevation of 600 feet above sea level. The area between this level and the proposed forest reserve is pineapple land of the highest quality. There is now under cultivation in pineapples upwards of 1000 acres, with every indication that that area will be very rapidly increased.

A very large proportion of the bananas and rice produced in the Territory also comes from the same district.

Your Committee consider the proposed reserve to be the most important water shed of its size in the Territory. They are further of opinion that not only should the reserve be made, but that an earnest attempt should be made, at as early a date as practicable, to reforest the slopes below the present forest line in order to, as far as possible, conserve the rainfall and prevent the rapid flow to the sea of the storm water so as to make the same available for longer periods between rains.

It is the belief of the Committee that the heartiest co-operation may be expected from the owners and lessees of private lands lying within the proposed reserve, not only in connection with establishing the reserve, but in connection with the proposed reforestation. Mr. Low, manager of the Honolulu Plantation, has already volunteered to carry out a tree-planting program on the lands back of his plantation, not only within but below the proposed forest lines. Such tree-planting program should receive every possible assistance from this Board.

Your Committee are of opinion that the reserve recommended by Forester Hosmer should be recommended by the Board to the Governor for formal reservation as a forest reserve, and recommend to the Board the adoption of a resolution to that effect.

Yours respectfully,

L. A. THURSTON,
ALFRED W. CARTER,
W. M. GIFFARD,
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

January 16, 1906.

Committee on Forestry,

Board of Agriculture and Forestry,

Honolulu, Oahu.

Gentlemen:—I have the honor to submit herewith a report, with recommendations, upon the proposed forest reserve on the western slope of the Koolau Mountains in the Ewa Basin, on Oahu. The report is the outcome of a series of personal examinations made at different times during 1904 and 1905, when portions of the reserve were visited and the location of the proposed boundary considered on the ground.

The first active steps toward the creation of a forest reserve in the Ewa Basin were taken some three years ago when Mr. W. F. Dillingham, the District Forester for Ewa, submitted to Governor Dole a report, accompanied by an outline map, suggesting a forest reserve, the boundaries of which closely correspond with those recommended below. The report and map are now on file in my office.

AREA INCLUDED.

The area included in the Ewa Forest Reserve embraces the mauka portions of the lands lying between the western boundaries of Moanalua and Wahiawa. The lower boundary follows approximately the lower edge of the existing forest for a good share of the way, save that back of the Honolulu Plantation the reserve line is somewhat lower down the slope than it is further to the north. The upper boundary of the reserve is the main divide along the crest of the Koolau Mountains. The lands included lie for the most part in the Ewa District but two, Waianae-uka and Wahiawa, are, respectively, in the Districts of Waianae and Waialua. The waters from the last named lands flow toward Waialua, not toward Ewa.

The reservation of the remainder of the Koolau forest tributary to the Waialua Basin only waits the completion of a description of the forest line. This in hand, the reserve will be extended to cover the area from Wahiawa to Waimea, all privately owned land.

OBJECT.

The purpose of the Ewa Forest Reserve is to insure the continuance of the forest on the Koolau Mountains and to increase its efficiency as a protection forest by bringing the area under a system of forest administration.

GENERAL CONSIDERATIONS.

The Ewa Basin contains some of the most productive land in the Territory. The cane fields of the three large sugar plantations of Ewa, Oahu and Honolulu, together cover an area of a little over 20,500 acres. In 1905 70 per cent. of the sugar produced on Oahu, or 20 per cent. of the entire output of the Territory, came from these three plantations. The figures for the two preceding years are only slightly different; the yield in 1904 being 66 per cent., in 1903 69 per cent. of the Oahu output—and of the total Hawaiian crop, 18 per cent. for 1904 and 19 per cent. for 1903.

All of this great and productive area of sugar land in the Ewa Basin is dependent on irrigation, for sugar cane cannot be profitably grown on this part of Oahu without an abundant supply of water.

The water for irrigation comes in part from streams rising in the Koolau Mountains and the Waianae Hills, through the diversion of the natural flow and the impounding of storm water, and in part from artesian wells. The greater part of the surface water is developed on the Koolau, rather than the Waianae side of the Basin, and although the geology of Oahu has not yet been fully worked out, it appears that the water-bearing strata tapped by the artesian wells also depend largely for their supply on the precipitation on the Koolau Mountains.

It is therefore important that as much as possible be done to preserve and protect the forest on this important watershed. If the steep slopes of the Koolau Mountains are covered with vegetation much of the water falling as rain can be retained for possible use, whereas were the slopes bare, a large share of the precipitation would escape as flood water, not only evading its duty and being lost to use, but doing damage along its course as well.

On reaching the edge of the forest many of the smaller streams now dwindle away until only the dry beds are left. If the forest came further down the slope the water in the streams would also be found lower down. This is not because the rainfall would be increased, but because forest is a better cover for a watershed than is open grazing land, because it helps to keep the flow in the streams regular and to prevent loss through rapid run off and, to some extent, evaporation. There is some evidence tending to show that formerly the area of light showers reached further down the mountain than it does now. Whether or not a heavy forest coming as far down as the present forest fence would assist in drawing the rain-bearing clouds further down the slope cannot be said, but the influence which the forest does exert on the water that actually reaches the ground is direct and tangible.

OWNERSHIP.

By far the greater part of the area making up the Ewa Forest Reserve is in private ownership. The three government lands within the boundary are Aiea, Waimano and Wahiawa. Aiea is under a lease which runs until January 14, 1912. The area within the forest reserve is 383 acres. The lower portion of Waimano is also under lease, but the area above the existing forest fence was reserved, to be held as forest, when the present lease was made in 1898. One of the provisions of this lease is that the forest fence be built and maintained. The area above the fence is given in the Land Office List as 781 acres. On Wahiawa the leasehold covers the water rights only, so that the land itself may, under the law, be set apart as a compartment of the reserve. Such action would interfere in no way with the water lease. Indeed, the essential reason for the creation of the Ewa, like most of the Hawaiian forest reserves, is that the water from the watersheds they cover, may be conserved for proper utilization. The area of Wahiawa is 3978 acres.

Below is given a table showing the names, owners, and lessees of the lands of which portions are included in the Ewa Forest Reserve, with the dates on which the existing leases expire.

It should be noted that the Honolulu Plantation Company holds

sub-leases of the area suitable for sugar cane on the lower portions of the following lands: Halawa B, Halawa A, Aiea, Kalauao, Kaonohi, Waieli and Waimalu. Similar sub-leases are held by the Oahu Sugar Company for the cane area on the lands of Waiau, Waimano, Manana, Waiawa and Waipio. In most cases the leases of cane land cover only the area below the 650 foot level, the section between that elevation and the forest reserve boundary remaining in the control of the owner or original lessee.

It should be further noted that upon the expiration of the existing leases on Halawa A, Kalauao, and Kaonohi, a new lease to the Honolulu Plantation Company, running till September 1st, 1940, goes into effect, by which the area above the forest line proposed in this report, is reserved. On Waieli a new lease to run for eleven years begins on January 1, 1907, by which the forest land is reserved. New leases for long terms containing similar provisions will go into effect on Waimalu, and probably on Halawa B as well, when the existing leases run out. The lower part of Halawa B, up to the 650 foot level, is now under a long lease to the Honolulu Plantation Company, which company also holds the other leases just mentioned.

From this statement it will be seen that after 1908 the only important lands above the forest line remaining unreserved are Aiea (government), Pohakapu (Catholic Mission) and Waianae-uka (U. S. War Department), and it is possible that some arrangement in regard to them may be reached with the present lessees.

There are said to be a number of kuleanas of varying size within the reserve boundary, especially on the land of Waimalu, but apparently few of these lots have as yet been definitely located. They need not be considered further here.

In the preparation of the following table, I have received much assistance from representatives of the various companies and estates mentioned, especially from Mr. F. S. Dodge, Superintendent of the Bishop Estate. I desire here to make grateful acknowledgement for these favors.

Following is a

TABLE OF LANDS.

PORTIONS OF WHICH ARE WITHIN THE EWA FOREST RESERVE.

Name.	Owner.	Portion Within Reserve.	Lessee	Portion Adjoining Reserve.	Lease Expires.
Halawa B	Queen Emma Estate	Leased	Dowsett Company		September 1, 1908
* Halawa A	Bishop Estate	Reserved (in part)	Dowsett Company		September 1, 1908
Aiea	Government	Leased	Dowsett Company		January 14, 1912
Kalaupō	Bishop Museum	Reserved	Honolulu Plantation Company		September 1, 1940
Kaonohi (an ili of Kalanoo)	Bishop Estate	Reserved	Honolulu Plantation Company		September 1, 1940
Waieli (an ili of Waimalu)	C. M. Cooke	Leased	L. L. McCandless		January 1, 1907
Pohakapu (an ili of Waimalu)	Catholic Mission	Leased	L. L. McCandless		August 1, 1927
Waimalu	Austin Estate	Leased	L. L. McCandless		January 1, 1907
Waiau	Bishop Estate	Reserved	Oahu Railway & Land Company		July 1, 1940
Waimano	Government	Reserved	Oahu Railway & Land Company		February 22, 1919
Manana	Oahu Railway & Land Co.	Reserved	(Not leased.)		
Waiawa	Bishop Estate	Reserved	Oahu Railway & Land Company		July 1, 1940
Waipio	Ii Estate	Reserved	(Not leased.)		
Waiānā-uka	U. S. Government (War Department)	Leased	Dowsett Company		January 14, 1912
Wahiawa	Government	Water rights leased	Waialua Agricultural Co. & Hawaiian Fruit & Plant. Co.		October 11, 1948

* Halawa A is reserved above a line drawn parallel to the Government road, three miles mauka of it.

FOREST FENCES.

The existing forest fences which mark a good portion of the lower boundary of the Ewa Reserve, date back from eight to twelve years. The section across Waipio was completed during the spring of 1894, while that across the lands of Waiawa, Manana, Waimano and Waiau was built in 1898. Much of the way the fence marks the lower edge of the forest. In some places there is open land above it and occasionally, especially in the gulches, tongues of forest come further down. The fence does not follow an exact course. It was, rather, run where it could be most easily built, at about the required elevation.

Back of the Honolulu Plantation various stretches of fence built at different times follow the 650 foot contour and mark the upper line of the cane land. While not on the forest line, sections of this fence could be utilized to protect the forest reserve. In some cases, with the exclusion of cattle from the upper lands the necessity for a forest fence disappears, while in other instances a forest fence will have to be built. There are division fences running mauka on the Kalauao-Aiea and on the Halawa B-Moanalua boundaries.

THE FOREST.

The forest on the western slope of the Koolau Mountains belongs to the type which has been described in former reports of mine as being characteristic of the elevations between one and four thousand feet in the Hawaiian group. Ohia Lehua (*Metrosideros polymorpha*) and Koa (*Acacia koa*) are the most important species and predominate among the trees in mixture. With them is associated a considerable number of other trees, mainly of small size and minor importance, and also many shrubs, large ferns, climbing vines and other plants, which together form a dense mass of vegetation under the canopy of the main forest trees.

In the gulches Kukui (*Alcurites moluccana*) is a common tree, its greenish white foliage adding much to the picturesqueness of the scenery. Guava (*Psidium guajava*) and Lantana (*Lantana camara*) are much in evidence in the broader gulch bottoms and on some of the flats near the forest fence. Practically the only commercial use to which the forest is now put is the use, in

places, of the Guava for charcoal, and the occasional cutting of trees for fuel or fence posts.

When open areas have been protected for some time by the fence, there are often dense mats of the Staghorn fern or Uluhi (*Gleichenia dichotoma*), through which the Amau, and other ferns and brakes, are gradually forcing their way—the first steps in the return of the forest. On the exposed ridges and in places where the Hilo grass (*Paspalum conjugatum*) has taken a firm hold a long time must elapse before the land can again be covered with trees. Where the ferns have not been entirely stamped out the forest comes back again much more speedily.

Examinations made primarily to determine the location of the reserve boundary do not offer good opportunities for a careful study of the typical forest of the reserve. They are concerned with its borders—while to know the forest one must get back into the mountains. The necessarily brief mention made in these reports should therefore be considered only as introductory to detailed studies of the several types of the Hawaiian forest which it is expected will be made after the more pressing work of creating reserves and getting the system of forest administration under way, is further advanced.

TREE PLANTING.

Mr. James A. Low, Manager of Honolulu Plantation, has made a proposition to the Bishop Estate and other owners of land back of his plantation, to plant parts of the area between the edge of the existing woods and the upper line of the agricultural land, with forest trees. The exact details of this offer are not in hand, but in general terms Mr. Low's idea is to systematically establish a forest plantation on the open land now used for stock grazing. The plan is perfectly feasible and the forestation of this section would unquestionably be of material benefit to the Honolulu Plantation.

It need hardly be said that the Division of Forestry is keenly interested in Mr. Low's proposal and stands ready to assist in carrying out the plan in every possible way.

In this connection I wish to record my appreciation of the interest taken by Mr. Low in the establishment of the forest line recommended in this report. By Mr. Low's direction a number of points on the lower boundary of the reserve, back of the

Honolulu Plantation, were carefully located by the then plantation surveyor, Mr. George J. Wagner, who also prepared a map of this section, showing various data of value in this connection.

EXTENSION OF THE RESERVE.

An extension of the Ewa Forest Reserve could with advantage be made on its southern border to take in the mauka portions of the lands of Moanalua and Kahauiki. Already a forest fence following the Halawa B-Moanalua boundary and crossing the land of Moanalua a little below the late Mr. S. Ed. Damon's mountain house, "Top Gallant," protects the forest and makes it a private reserve. This area is not now included in the Ewa Reserve because no description of the line is at present available. It may later be recommended.

THE BOUNDARIES.

In laying out a forest line across private land, the desire of the owner has naturally much to do with its location. In general the attitude of those owning land within the Ewa Forest Reserve is well indicated by the construction of the existing fences and the provisions regarding forest reservation and protection which are embodied in all the new leases. Without exception the owners of the private lands are in favor of forest reservation, for they appreciate the need and importance of safe-guarding the Ewa watershed.

It remains, however, to bring this area under a definite and comprehensive system of forest management before the objects for which it is reserved can be fully attained. Such a system, through the efficient protection of the existing forest and the extension of the forest cover through planting, where that may be needed, would put the Ewa Reserve to its best use and increase its value to those already benefited by it.

The fact that a forest fence has already been built is a strong argument for its adoption as the lower forest line, and although the reserve boundary between Waimalu and Waianae-uka might in some places be drawn with advantage lower down, I believe the fence line meets so many of the requirements that it is doubtful, all things considered, if a better location could at this time be made. The location of the forest line across the lands back of

the Honolulu Plantation has been the subject of careful study made on the ground by me in consultation with representatives of the various interests involved. As here recommended the line meets with their approval.

RECOMMENDATION.

For the reasons above set forth, I therefore recommend the creation of the Ewa Forest Reserve, with boundaries as called for in the description compiled by the Government Surveyor, which accompanies and forms a part of this report. And I further recommend that if this report meets with the approval of the Board that the Governor be requested to declare the area a forest reserve, after the hearing required by law, and to set apart as compartments thereof the portion of the government lands of Waimano and Wahiawa lying within the reserve boundary.

I also recommend that steps be taken to secure the co-operation of the owners of private land within the Ewa Forest Reserve, that the reserve as a whole may be brought under an efficient system of forest management.

DESCRIPTION.

[Here follows a technical description of the boundary of the Ewa Forest Reserve, compiled by Mr. W. E. Wall, Government Surveyor. As the description is lengthy and will later be published in this magazine as a part of the Proclamation creating the Reserve, it is omitted here. The area of Ewa Reserve is 28,550 acres, more or less.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REVISED LIST OF SEED FOR SALE AT THE GOVERNMENT NURSERY.

The following list of seeds and plants for sale at the Government Nursery has just been issued as Press Bulletin No. 3 of the Division of Forestry, to answer inquiries frequently received from persons desiring to plant trees. It may with advantage be consulted in connection with Circular No. 1 of the same

Division, entitled "An Offer of Practical Assistance to Tree Planters."

SEED COLLECTED IN NEIGHBORHOOD OF HONOLULU.

FOREST TREES.

Common and Scientific Name.	Approximate	Price
	No. Seeds Per Oz.	Per Oz. Cents.
Koa (<i>Acacia koa</i>).....	500	15
*Ironwood (<i>Casuarina equisetifolia</i>).....	22,000	10
*Blue Ironwood (<i>Casuarina glauca</i>).....	20,000	15
Red Gum (S. W. Australia) (<i>Eucalyptus calophylla</i>).....	350	50
*Yate (<i>Eucalyptus cornuta</i>).....	80,000	50
*Bloodwood (<i>Eucalyptus corymbosa</i>).....	70,000	50
*Stringybark (<i>Eucalyptus eugenoides</i>).....	85,000	50
*Swamp Gum (<i>Eucalyptus gunnii</i>).....	80,000	50
*Ironbark (<i>Eucalyptus leucoxylon</i>).....	80,000	50
*Yellow Box (<i>Eucalyptus melliodora</i>).....	80,000	50
*Leather-Jacket (<i>Eucalyptus punctata</i>).....	90,000	50
*Red Mahogany (<i>Eucalyptus resinifera</i>).....	90,000	50
*Swamp Mahogany (<i>Eucalyptus robusta</i>).....	90,000	50
*Red Gum (<i>Eucalyptus rostrata</i>).....	90,000	50
Silk Oak (<i>Grevillea robusta</i>).....	1,500	20

[The kinds starred (*) are sold in 5 and 10 cent packages.]

ORNAMENTAL AND STREET TREES.

Red Sandalwood (<i>Adenanthera pavonina</i>).....	85	25
Siris Tree (<i>Albizia lebbek</i>).....	120	25
Monkeypod (<i>Albizia saman</i>).....	150	15
St. Thomas Tree (<i>Bauhinia tomentosa</i>).....	120	25
Berria (<i>Berria ammonilla</i>).....	1,000	20
Silk Cotton (<i>Bombax ceiba</i>).....	400	25
Red Dyewood (<i>Caesalpinia sappan</i>).....	30	25
Yellow Poinciana (<i>Caesalpinia</i> sps.).....	330	25
Pink Shower (<i>Cassia grandis</i>).....	38	25
Golden Shower (<i>Cassia fistula</i>).....	150	25
Pink and White Shower (<i>Cassia nodosa</i>).....	120	25
Duranta (White) (<i>Duranta plumieri alba</i>).....	400	25
Duranta (Blue) (<i>Duranta plumieri</i>).....	400	25
*Henna (<i>Larsonia alba</i>).....	24,000	20
Pride of India (<i>Melia azedarach</i>).....	30	10
African Locust (<i>Parkia africana</i>).....	30	10
Royal Poinciana (<i>Poinciana regia</i>).....	50	10
Pepper Tree (<i>Schinus molle</i>).....	780	20
Milo (<i>Thespesia populnea</i>).....	100	25

IMPORTED SEED.

FROM AUSTRALIA.

*Australian Ironwood (<i>Casuarina stricta</i>).....	20,000	40
*Turpentine Tree (<i>Syncarpia laurifolia</i>).....	90,000	40
*Apple Tree of New South Wales (<i>Angophora sub- velutina</i>)	1,000	50
*Black Box (<i>Eucalyptus bicolor</i>).....	90,000	45
*Karri (<i>Eucalyptus diversicolor</i>).....	20,000	60
*White Gum (<i>Eucalyptus haemastoma</i>).....	80,000	45
*Gray Box (<i>Eucalyptus hemiphloia</i>).....	90,000	45
*Ironbark (<i>Eucalyptus leucoxylon</i>).....	90,000	50
*Woolly-Butt (<i>Eucalyptus longifolia</i>).....	90,000	40
*Jarrah (<i>Eucalyptus marginata</i>).....	6,600	50
*Messmate (<i>Eucalyptus obliqua</i>).....	30,000	40
*Yellow Blackbutt (<i>Eucalyptus obtusifolia</i>).....	30,000	40
*Giant Gum (<i>Eucalyptus regnans</i>).....	40,000	50
*Weeping Gum (<i>Eucalyptus saligna</i>).....	90,000	40
*Forest Red Gum (<i>Eucalyptus tereticornis</i>).....	80,000	40

FROM CALIFORNIA.

*Blue Gum (<i>Eucalyptus globulus</i>).....	7,800	30
Black Wattle (<i>Acacia decurrens</i>).....	2,200	25
Australian Blackwood (<i>Acacia melanoxylon</i>).....	2,000	25
Cootamundra Wattle (<i>Acacia baileyana</i>).....	1,000	30
Leather-leaf Ash (<i>Fraxinus velutina</i>).....	1,400	40
Monterey Cypress (<i>Cupressus macrocarpa</i>).....	3,700	10
Redwood (<i>Sequoia sempervirens</i>).....	5,000	25
Bigtree (<i>Sequoia washingtoniana</i>).....	4,000	40
Canary Island Pine (<i>Pinus canariensis</i>).....	225	25
Scotch Pine (<i>Pinus sylvestris</i>).....	4,800	15
Seaside Pin (<i>Pinus maritima</i>).....	550	15
White Pine (<i>Pinus strobus</i>).....	2,000	20

FROM GERMANY.

Ceara Rubber (<i>Manihot glaziovii</i>).....	50	20
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PALM SEED.

		Price per 100
Red Palm (<i>Areca rubra</i>).....	30	\$1.50
Wine Palm (<i>Caryota urens</i>).....	10	1.50
Oil Palm (<i>Elaeis guineensis</i>).....	5	2.00
Fan Palm (<i>Latania borbonica</i>).....	12	1.00
Royal Palm (<i>Oreodoxa regia</i>).....	60	1.00
Loulu Lelo (<i>Pritchardia gaudichaudii</i>).....	8	2.50
House Palm (<i>Thrinax argentea</i>).....	120	1.00

TREE SEEDLINGS.

Beside seed there is also kept on hand a limited number of tree seedlings. The following kinds may be bought for 5 cents each:

Monterey Cypress (*Cupressus macrocarpa*).

Brazilian Rosewood (*Jacaranda mimosaeifolia*).

Longan (*Nephelium longana*).

The trees listed below are sold at 2½ cents each:

Ironwood (*Casuarina equisetifolia*).

Blue Ironwood (*Casuarina glauca*).

Lemon-scented Gum (*Eucalyptus citriodora*).

Swamp Mahogany (*Eucalyptus robusta*).

Silk Oak (*Grevillea robusta*).

Siris Tree (*Albizzia lebbek*).

Golden Shower (*Cassia fistula*).

Pink Shower (*Cassia grandis*).

Royal Poinciana (*Poinciana regia*).

Pride of India (*Melia azedarach*).

Pepper Tree (*Schinus molle*).

Packets containing seed will be sent postpaid upon receipt of price. Remittances must be made in coin or by U. S. Money Order, payable to the order of David Haughs.

Persons desiring tree-seed in large quantities are requested to place their orders well in advance.

All communications in regard to seed should be addressed to David Haughs, Box 331, Honolulu, T. H.

To stimulate interest in tree planting and to encourage the introduction and wider application of improved ways of planting, caring for and finally of cutting the trees in forest plantations, the Division of Forestry stands ready to render assistance to individuals or corporations desiring to undertake such work. Full particulars of the plan of co-operation may be found in Circular No. 1 of the Division of Forestry, entitled "An Offer of Practical Assistance to Tree Planters."

RALPH S. HOSMER,
Superintendent of Forestry.

Feb. 14, 1906.

AN OFFER OF PRACTICAL ASSISTANCE TO TREE PLANTERS.

[Issued as Circular No. 1, of the Division of Forestry, in January, 1906.]

INTRODUCTION.

Among the imports into Hawaii for the fiscal year ending June 30, 1905, wood products ranked seventh in value, the total for timber, lumber, door and window fittings, etc., and for furniture, being \$528,110. In a price list recently issued by one of the leading lumber dealers in Honolulu ordinary rough lumber, Northwest (Red or Douglas Fir) and Redwood, is quoted at from \$30 to \$35 per M., while Redwood fence posts are listed at 24 cents each. No stronger commentary is needed on the desirability of a local supply.

THE OFFER.

To assist in meeting the demand, the Division of Forestry stands ready, so far as its limited appropriation will permit, to render practical and personal assistance to individuals or corporations desiring to establish forest plantations, wood lots or windbreaks, or to do other forest work.

This assistance is given in two ways:

First, by keeping constantly on hand fresh seed of the more important native and introduced trees and also a limited number of nursery grown seedlings of the kinds most in demand; the seed and plants being sold at prices just covering the cost of collection or growing.

Second, by advice and suggestion as to the kinds of trees best adapted for the purpose, locality and situation of the person desiring to plant, and the methods to be pursued to secure the best results in the planting.

On each of the larger islands of the Hawaiian group there are considerable areas of forest, which play an important part in protecting the water sheds of the streams needed for fluming or irrigation, but unfortunately the native Hawaiian trees are for the most part not of economic importance. Where they are of value it is because of their worth as cabinet and other high class woods, rather than because they furnish construction material. To meet the ever growing demand for wood suitable

for the various purposes of domestic supply, fence posts, railroad ties, bridge timbers and general construction, not to mention fuel, which in certain districts is an important consideration, the Territory stands in great need of forest plantations of timber producing trees.

Tree planting on a large scale in this country is necessarily a somewhat expensive operation and when undertaken should be done advisedly and in accordance with a systematic plan. The purpose of the Division of Forestry in offering to co-operate with the individual planter is to stimulate interest in tree planting, and by the introduction of good methods to secure the best results in the work done. To explain the offer of co-operation is the object of this circular.

THE WORK OF THE DIVISION OF FORESTRY.

Forest work in Hawaii falls naturally under two general heads: (1) the creation of forest reserves and the establishment of a system of forest administration, and (2) the introduction and propagation of exotic trees of value to the Territory.

The forest reserve work has received first attention since the organization of the Division of Forestry and will continue to do so until the system is established and well under way. The reserves are for the most part "protection forests" on the important water-sheds and are made by setting apart areas of existing forest. While their essential object is to protect the slopes they cover, it is hoped that eventually, under forest management, the reserves may also be made to yield forest products on an economic basis.

The other main line, plant introduction, is of no less importance, but owing to the limited appropriation now available, it has for the present to take second place.

There are many areas of waste land in the Territory where forest trees could, with advantage, be planted. On almost every sugar plantation are unproductive corners and strips of land, where it is not advisable to plant cane, which could well be devoted to trees. The proper kinds being set out would in time yield good returns for bridge timbers, fence posts, railroad ties or fuel, besides in the meantime improving the appearance of the country-side. But tree planting is not restricted to the corporation or to the larger owner alone.

To the homesteader it is equally, perhaps even more important, to have a wood lot from which he can obtain supplies of wood or fuel. And further, it should not be forgotten that the sale value of a place is increased by the presence of trees about the house, the whole protected if need be by a wind-break on the exposed side.

TREE PLANTING IN THE PAST.

The recommendations of the Division of Forestry are based on what has been actually accomplished in the Territory and on technical information brought together by the members of the staff. During the past thirty years much tree planting has been done in Hawaii—many species of trees having been tried under a variety of conditions and in many localities. Some have succeeded well. Others through their failure have proved equally instructive. The planting has included road-side and ornamental planting as well as windbreaks and forest plantations made primarily for commercial returns. As a result of all this work much valuable information has been accumulated, some of which the Division of Forestry expects later to publish in the form of bulletins. At present it has not been fully compiled.

THE PLAN OF CO-OPERATION.

The Division of Forestry stands ready to give advice as to the kinds of trees best adapted for particular needs and as to the methods which should be followed to insure success, in all classes of forest-tree planting. It will also undertake for a time to give advice on road-side and street tree planting, although this is not strictly within the province of forest work.

The Division of Forestry has already in hand sufficient information so that in many instances, advice can at once be given to fully cover the needs of the applicant, particularly where only a limited area is to be planted. In other cases, and especially where planting is to be done on a large scale, an agent of the Division will visit the locality and inspect the conditions on the ground. Having become familiar through a personal examination with the situation, soil, exposure and other factors, he is prepared to make definite and comprehensive recommendations. These may sometimes be given verbally, but will usually be embodied in a planting plan. The

planting plan includes a statement of the species best adapted for the desired purpose in the given locality, directions in regard to the starting and care of the seedling trees in the nursery, the preparation of the soil, transplanting and setting out, the proper spacing of the trees and the subsequent care necessary to be given them. When advisable a diagram or sketch plan illustrative of the arrangement or spacing of the trees accompanies the report.

The services of the agent of the Division of Forestry are without cost to the applicant, but his expenses for traveling from Honolulu to the locality visited and return, and his subsistence must be borne by the applicant. When several persons on a single island are visited on one trip, the cost of the trip will be divided among them.

As one of the objects of the Division of Forestry in co-operating with the individual planter is to secure the general introduction of better methods, the Division reserves the right to publish and distribute the plan and its results for the information of the public.

Applications will so far as possible be considered in the order in which they are received, but precedence may be given to those likely to furnish the most useful examples.

The form of co-operative agreement to be entered into by the individual planter and the Division of Forestry is given below. The agreement is not a formidable legal instrument; it is merely a statement of the conditions upon which the planting plan is prepared, and is only drawn up to prevent misunderstandings. It may be cancelled by either party upon ten days' notice:

TREE PLANTING AGREEMENT.

Honolulu, Hawaii,

....., 190..

The Division of Forestry of the Board of Agriculture and Forestry of the Territory of Hawaii and..... of Island of, Territory of Hawaii, mutually agree as follows:

1. The Division of Forestry, in order to spread a knowledge of practical forestry in the Territory and to encourage tree planting therein, through the introduction and wider application of improved ways of planting and caring for forest plantations, wood lots and wind-breaks,

agrees to prepare a planting plan for.....acres of the land of the said
....., situated and described as follows:

.....
.....
.....

2. The owner agrees to pay the traveling and subsistence expenses of the agent of the Division of Forestry, while engaged in the field work incident to the preparation and carrying out of the said planting plan.

3. The owner does not agree to put the said plan into operation until it has been accepted by him.

4. The owner agrees to keep such records of the work done under the said plan as may be recommended therein, and he further agrees that the Division of Forestry may publish, for the objects named in the first paragraph of this agreement, the information gained while preparing the plan or taken from the record made by the owner.

5. After the completion of the said planting plan and its acceptance by the owner, the Division of Forestry will, upon a written request, undertake to supervise the execution thereof, so far as may be necessary, at a cost to the said owner to be definitely agreed upon before such supervision is undertaken.

6. This agreement may be dissolved by either party upon ten days' notice given to the other in writing.

(Signed)
Owner.

(Signed)
Superintendent of Forestry.

HOW TO MAKE APPLICATION.

Applications for the assistance offered in this circular must be made in writing to the Superintendent of Forestry, P. O. Box 331, Honolulu. They should specify the exact location, the acreage to be planted, the object for which the planting is done, and the time when it is desired to begin planting.

Correspondence in regard to the purchase of seed and plants should be addressed to Mr. David Haughs, Forest Nurseryman, P. O. Box 331, Honolulu.

RALPH S. HOSMER,
Superintendent of Forestry.

APPROVED:

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

L. A. THURSTON, *President.*

Honolulu, Hawaii, December 28, 1905.

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Works, Blue 291

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for $2\frac{1}{2}$ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

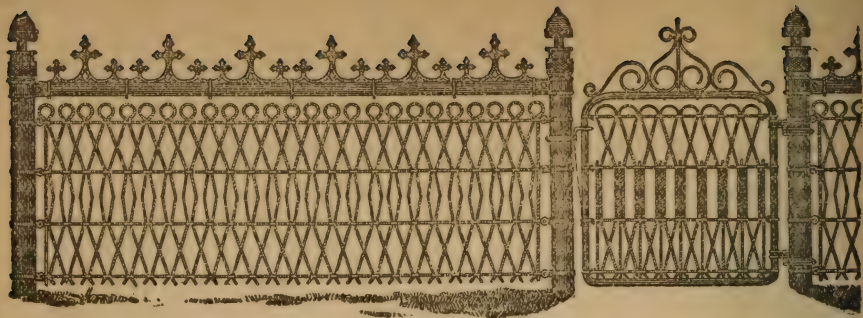
"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

WRITE TO-DAY FOR RATES

The Mutual Life Insurance Company of New York
W. A. WANN, District Superintendent,

Vol. III.

MARCH, 1906.

No. 3.

Price, 10c. Per Copy ; Per Annum, \$1.00; Foreign, \$1.25.

THE
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AND
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OF

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ISSUED UNDER THE DIRECTION

OF THE

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HONORARY EDITOR

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL III.

MARCH, 1906

No. 3

Among the many excellent efforts now being put forth to render the environs of Honolulu more attractive and picturesque, it is to be hoped that due regard will be given to the preservation of our native trees and to their extended cultivation. Few foreign plants are more appropriate to our island scenery than those with which nature has clothed our heights and valleys, yet often preference is given to exotic trees of questionable utility and attractiveness. Whenever the imported species does not possess any superiority over Hawaiian trees it would be well to give the latter priority. The fern-like foliage and rapid growth of the Algaroba have long established it in popular favor, and the utility of its wood and beans have brought it into prominence as the tree of greatest economic importance in Honolulu. The sturdy ironwood is another introduction which has won a permanent home here, although its foliage and appearance recall a less congenial clime. The poinciana, too, despite its unsightly and untidy aspect during most of the year, redeems itself by its wonderful florescence, and although unsuited for growing alone will always find a use when associated with other trees. The casuarina, and many flowering trees and shrubs, and imported palms have alike proved their fitness for extensive use. Yet none of these conforms with the beauty of our island more fitly than the delicate colored foliage of the kukui, the cool inviting shade of the kamani, the picturesque beauty of the hala, or the fan-like leaves of the graceful loulu palm.

These and many others of our native flora are worthy of more extensive cultivation in private and public lands. The preservation of such specimens as remain in Honolulu and its vicinity also deserves attention. On the Pali road are many hala trees struggling for existence beneath the heavy weight of an imported evil smelling vine which encumbers them. It would surely be a worthy act to relieve them of their unsightly load and thus add to the picturesqueness of the valley the beauty of one of our most interesting and characteristic trees.

1906

Much lack of foresight is often observable in the unmethodical selection of trees for planting on small lots. Very often this was done in former years without regard to the future development or suitability of the kinds chosen, and the occupant apparently strove only to plant as many seedlings as could be accommodated in the space at his disposal. The result has been that many yards are now covered with a veritable jungle, in which no tree has been able to attain a generous growth, but all have struggled for a precarious existence. In commencing the work of local improvement, the first advance has often been made in thinning out the trees and plants upon vacant land and public gardens, and much benefit has resulted by this procedure. It is, however, of great importance that before the axe is set indiscriminately at work, the opinion of some one experienced in tree lore or possessing a general knowledge of botany should be consulted. During the past month we have seen a stately and valuable *araucaria* felled by private enterprise in order to accommodate an inferior mango tree, and many other acts have lately taken place, which could never have been tolerated by a lover of nature. In this way Honolulu has been despoiled of some of the rarest and most beautiful examples of its flora, which it will require many years to replace.

The application of scientific knowledge and modern improvements to the cultivation of the soil have during the last few years achieved such important results for agriculture that no farmer can now be sure of success without a special training in branches of learning which formerly were considered of academic or speculative importance. The diversity and amount of knowledge now requisite in the husbandman is far greater than can be acquired in a training solely confined to farm life. In order to equip himself for successful competition with his fellows it is now necessary for the aspiring farmer to attend a course of instruction at an agricultural institution where he may benefit by the accumulated experience of the agriculturist and the learning of the scientific investigator. Technical colleges have long proved their utility in furnishing competent workers to the varied branches of

industry, and the exigencies of modern life are now calling into existence a system of institutions which is producing a race of educated farmers. It is to be expected that Hawaii will before long possess a thoroughly equipped agricultural college akin to those already established and which are proving themselves of such utility on the mainland.

In this country little economic use is made of the Prickly pear. The diffusion of this remarkable plant to various parts of the world is chiefly due to the Portuguese who have introduced it extensively to India and Mediterranean countries. In the former country on account of its wonderful rapidity of growth and vitality it has taken possession of immense tracts of land and become difficult to eradicate. In Southern Europe its refreshing, though somewhat insipid fruit, has been found to respond well to cultivation, and three well marked varieties have been produced, the red, the white and the yellow. The cultivated fruit is of increased size and is much esteemed. The plant thrives best on well drained lime soils and is greatly improved by fertilization.

Following the public hearings held on March 7th, to consider the setting apart of certain areas on Oahu and Kauai as Forest Reserves, Acting Governor A. L. C. Atkinson on March 9th, 1906, signed the two proclamations appearing elsewhere in this issue, creating respectively the Ewa and the Kealia Forest Reserves. Both of these new reserves are important additions to the chain of Hawaiian forest reserves, because each covers a watershed on which much valuable land is dependent for its water supply. The total area of the Ewa Forest Reserve is 28,550 acres, more or less, of which 4,759 acres are actually set apart. The area of the Kealia Forest Reserve is 9,935 acres. In this case 7,385 acres are set apart. The reasons underlying the creation of both these reserves were set forth at length in the reports of the Superintendent of Forestry published in full in the Forester for February, 1906.

LIMU.

A publication recently issued from the University of California and written by William Setchell under the above title, deserves attention. The writer is indebted to his informant on the subject of a short visit to the Hawaiian Islands in the summer of 1900, during which he collected his data on the shores in the neighborhood of Honolulu and Hilo.

The "Limu" of the Hawaiian Islands is a term applied to edible seaweed, restricted chiefly to Algae and certain lichens. The term is also extended by the natives to include a few Ascidi-ans, Corals and other motionless animals. The names and uses of the different varieties of limu are numerous, but it is difficult to obtain them from the present generation.

Limu is eaten by the native Hawaiians generally in its uncooked condition, and at low tide it is a common sight to see the women gathering it wherever the coast is favorable to its growth. In the Hawaii Almanac and Annual for 1886 the Rev. C. M. Hyde, speaking of ferns, says: "To genuine Hawaiians a feast is not a regular luau, as foreigners call such festivals, without the presence of these dryads of the mountains, and as lovingly do they rejoice also in bringing to the feasts those nymphs of the sea, the limu (sea mosses), some of which, like the *lipoa*, have become to the Hawaiian the synonym of the most delicious fragrance."

The Hawaiians are very particular in their selection of limu and especially esteem those obtained from certain localities. The foreigner, as a rule, hesitates to attempt the new food,, but when he overcomes his prejudice he is often rewarded with flavors that repay his temerity. The paper in question, concludes with a description of various kinds of limu, arranged in alphabetical order. Whenever possible derivations are given and notes on the particular use of the variety referred to.

As with most Hawaiian lore, reliable information on the native use and nonenclature of this comestible is to be obtained from the older generation of natives who are rapidly passing away. A familiarity with the Hawaiian language is requisite to a proper elucidation of such subjects, as the information sought is as a rule possessed only by those who have little understanding of English and who are generally reluctant to impart it to strangers.

THE HAWAIIAN ENTOMOLOGICAL SOCIETY.

The Hawaiian Entomological Society was instituted in December, 1904, a preliminary meeting, presided over by Mr. Kotinsky, being held in the Board Room of the Bureau of Agriculture and Forestry, on the 15th of that month to consider the advisability of forming such an organization. At this meeting Mr. Kirkaldy was elected temporary secretary and Messrs. Craw, Kotinsky and Terry were appointed to draw up a constitution for the new society. On January 26th, 1905, the first regular meeting was held and a constitution adopted, which has already appeared in the Hawaiian Forester. Since that date regular meetings have been held and the association, which at the first preliminary meeting consisted of eight, now boasts twenty members, among whom are included nearly all the entomologists of the Territory.

The *raison d'être* of the society as stated in the constitution, is to promote the study of entomology in all possible bearings and to encourage friendly relations between those in any way interested in the science. From a perusal of the first number of the Proceedings of the Society for 1905, which has just been issued, it will be seen that these objects have been very satisfactorily fulfilled, and the meetings have elicited many interesting and valuable papers which have contributed materially to our knowledge of the insect fauna of our own and other lands. Among the most important articles which have been read during the year are to be included:

Notes on a Trip to Australia (Perkins).

Notes on Australian Butterflies (Perkins).

The History of Economic Entomology in Hawaii (Kotinsky).

Notes on a Trip to Hawaii (Swezey).

Insects Taken by Mr. Wilder at Midway Island (Perkins).

Literature of Hawaiian Entomology for 1905 (Kirkaldy).

Mouthparts of Sawflies (Van Dine).

A Method of Setting Insects (Perkins).

Food Habits of Hawaiian Birds (Perkins).

Mr. Van Dine's article contains two excellent plates drawn by the author.

Among much which is technical in the "Proceedings" are to be found information of great interest to the uninitiated reader.

The following is a brief summary of Mr. R. C. L. Perkins' paper on the Food Habits of the Native Hawaiian Birds.

"The Hawaiian Birds are classified according to their food habits as follows:

- (1) Honey or nectar suckers: useful because pollinizers.
- (2) Beneficial fruit eaters which spread the seed without injuring them, and propagate the native plants.
- (3) Harmful fruit-eating birds, which destroy seeds they eat.
- (4) Eaters of injurious insects: beneficial.
- (5) Eaters of useful insects are practically unrepresented.

In the family *Drepanididae* there are 34 species on the Hawaiian Islands, 12 of them feed on nectar regularly; 2 are doubtful honey-eaters; 7 rarely eat honey, yet were seen eating it; they have honey-sucking tongues and are apparently leaving off the honey-sucking habit and are taking to insect eating; 30 species eat noxious insects, certainly all of them feed their young on insects; most of these eat spiders which may be either beneficial or otherwise; 3 are beneficial fruit eaters; 3 are highly injurious fruit or seed-eaters, yet these also eat caterpillars and feed them to their young, and are thus far beneficial; 2 species are indifferent.

Of the four Oo, two are chiefly honey-suckers, but also eat insects and one is chiefly an insect eater; one is extinct. Most of these birds are now too rare to be of any practical value.

Of the five thrushes, which are very fine songsters, four are large fruit-eaters, but also devour insects; the fifth is an insect-eater confined to Kauai. There are three species of fly-catchers, all entirely insectivorous and very beneficial.

In a discussion on the use of insects as human food at the March meeting of 1905, Dr. Cobb stated that at one time a committee was appointed in Nebraska to experiment with grasshoppers for food. Although these insects were reported to be palatable, their general introduction as an article of diet seems to have failed. Mr. Terry reported that he had tested "Kungu" cake, which is made from a species of insect in the lake district of Central Africa and eaten by the natives there, and said that the flavor and texture suggested oatmeal.

Meetings of the Hawaiian Entomological Society are held

monthly in the Board Room of the Bureau of Agriculture and Forestry. Correspondence should be addressed to the Secretary-Treasurer, Jacob Kotinsky, Bureau of Forestry, King Street, Honolulu, from whom copies of the Proceedings may be purchased. At present the Society has no separate library and does not exchange its publications.

The following is the list of officers of the Society for 1906:

President R. C. L. Perkins

Vice-President G. W. Kirkaldy

Secretary-Treasurer Jacob Kotinsky

Members of Executive Committee.....

..... Otto H. Sweezy, D. L. Van Dine

Editors of the Proceedings.....

..... G. W. Kirkaldy and Otto H. Sweezy

SUPPORT FOR FIELD TOMATOES.

The staking of field tomatoes is now generally practiced by large growers of this popular vegetable and is claimed to well repay the expense on account of the increased earliness of the crop and its improved qualities. The method of staking partakes of the nature of a trellis, the end posts of which should be about five or six feet long. Provided the ground is not too uneven the trellis may be made of almost any length. At intervals of about twenty feet, strong stakes should be placed between the end post, and along the top of these, beginning from the end, a heavy wire should be fastened, and another parallel with it at about ten inches from the ground. It is essential to have the wires absolutely taut and to effect this a wire-stretcher should be used and the posts anchored by guy wires. A good, stout twine should then be strung transversely between the two lines of wire by means of a hitch in such a way as to prevent slipping. Upon these the vines are trained. If kept well trimmed from the beginning, the plants will soon attain a fine growth and bear abundantly.

THE BERKSHIRE PIG.

(Reprinted by permission from the Journal of the Department of Agriculture of Western Australia.)

The Berkshires are among the oldest, best known, and most popular of the improved breeds of swine. Their great adaptability to a variety of conditions, together with their early maturing qualities, and their ability to stand up under heavy weight, has earned for the improved Berkshire a place well up toward the head of the list as a general purpose or farmers' pig. To the many admirers of the trim animals of this breed which are to be seen in abundance at every leading show, something of the history of their development should be of interest. However, like many of the older breeds of stock of undoubtedly "blue blood," it is somewhat difficult to give their genealogy with accuracy.

As the very name implies, the breed is of English origin, and first attained a position of prominence in the County of Berk, or Berkshire, England. However, these original Berkshires were very different from their descendants of today, and it is considered doubtful if the breed attained to any considerable degree of perfection in its home county, the prevailing opinion being that the earliest marked improvement of the breed was made by the breeders of some of the other counties of southern and central England.

These original Berkshire pigs are generally described by all authorities as large, raw-boned, coarse pigs, with pendant ears, and of a colour ranging from a tawny white to a sandy red or black and variously spotted. It is thought by some that these early Berkshires were from the same ancestry as the Tamworth, and from the descriptions given it would seem that they more nearly approached that breed in type than they did the Berkshires of the present day.

Indefinite as is this description of the foundation stock from which this useful breed has been evolved, the means by which this improvement was brought about seems to be equally uncertain. Some writers tell us that the Chinese, Siamese, and Neapolitan crosses were used, while others draw the line at the Neapolitan cross, contending that the improvement was brought about entirely by crossing with the Chinese pigs, and still others affirm with equal certainty that the principal improvement was due to

the use of Italian and Spanish crosses during the latter part of the eighteenth century.

Among the first mentioned of the early improvers of the breed are Richard Astley and Lord Barrington. Lord Barrington did his best work as a breeder between 1820 and 1830, and it is asserted by some authorities that to him the chief improvement of the early Berkshire was due, and that most of the old English herds of quality traced their ancestry to this herd. However, a number of other prominent English breeders of later date are mentioned as contributing largely to the improvement of the Berkshires.

Early importations of the breed were made to America, several being recorded as occurring between 1820 and 1835. However, it was not until nearly half a century after the first importations that the breed attained to general favour in that country. In 1875, the first, or American Berkshire Association, was organized, and in 1893 the National Berkshire Record Association was formed. Since that time the improvement of the Berkshire has gone on as rapidly, if not more so, in America as in England. This widespread interest, however, caused a natural rivalry between breeders in those two countries, and in some sections the somewhat larger and coarser English type is the favorite. As was natural, several types of this breed sprung up during the early improvement, but a good degree of uniformity was finally established, and while there are still coarse and fine types of this breed, they are all possessed of the same general characteristics which have made the breed popular with the American farmer.

The Berkshires are among the largest of the medium breeds. They are adaptable to a wide range of conditions, probably heading the list of the improved breeds in this respect. They possess great muscular power, and more than ordinary activity. They possess the quality of early maturity to an extent which enables the breeder to fatten them at almost any age desired, yet when properly fed for a longer term they will attain to great weight and size. They have limbs with bone of good quality, which, together with their activity, makes them exceptionally good grazers. They are hearty feeders, and as a breed have a strong digestive and assimilative power, which enables them to give a maximum return for the food consumed, although they are of a rather nervous and excitable temperament, and need careful and quiet handling the best results. They are possessed of strong pre-

potency, and on this account are of great value for crossing upon the coarser breeds. They are medium to good breeders, and their meat is of good quality, being generally firm and well marbled. A summing up of these qualities marks the Berkshire as an excellent pig for the improvement of common or coarse stock and a dividend-payer for the farmer who keeps a few pigs and feeds and cares for them well. That many farmers have found him such is evidenced by the wide distribution of the breed over the United States, Canada and Australia.

Where this care and feed is insufficient, as is the case upon too many farms, there is some doubt about the superiority of so highly organized, nervously active a breed, and there is probably a wide difference in the appearance of a Berkshire in condition and a scrub of the breed than between similar types of almost any other of the improved breed of pigs.

It is unnecessary to enter into a detailed description of the beautiful, glossy, black, finely marked Berks, with which every farmer is familiar who has noted them at our agricultural shows. Their broad, straight backs, well sprung ribs, deep fleshed loins, and heavy quarters, appeal to every lover of tender, juicy pork, while the general appearance of a good-conditioned and well groomed Berkshire is such as will leave a lasting impression upon the interested spectator.

RABBITS IN NEW SOUTH WALES.

The Government of New South Wales has spent over \$4,000,000 for all kinds of means to prevent the growth of the rabbit plague, and it has now been decided to fence in the whole country with an immense wire net.

The expense of this wire net is estimated to exceed \$5,000,000, and it is thought that the wire required for this purpose can be imported from abroad at the cost of about \$150 per mile, delivered at Sydney.

The rabbit plague is increasing from year to year, which is best shown by the fact that such an enormous amount as \$5,000,000, or nearly 10 per cent. of the annual revenue of the country, is to be spent for this purpose.

CITRUS FRUITS IN HAWAII.

Under the above title, Mr. J. E. Higgins, Horticulturist, Hawaii Agricultural Experiment Station, contributes a valuable article to our local literature. The introductory paragraphs of the bulletin are here given:

"Citrus fruits were introduced into Hawaii more than a century ago. In the record of Vancouver's voyages it is recorded that in the year 1792 that explorer gave to one of the Hawaiian chiefs in Kona "some vine and orange plants," besides other valuable plants and seeds. A few days later "some orange and lemon plants that were in a flourishing state," were landed on the Island of Niihau. These oranges were probably from Tahitian seed, since Vancouver sailed from Tahiti to these islands and records having received large supplies from the natives before his departure. Even earlier attempts at the introduction of the orange and the lime are reported, but it is difficult to say which of the efforts was first successful. Some of the oldest orange trees in the islands are said to have been in a flourishing condition a few years ago at the residence of the late Thomas Brown, Esq., on Kauai.

Oranges, lemons, limes and pomelos have all found a congenial home in Hawaii. Indeed, the orange is sometimes thought of by the casual observer as being indigenous, so eminently suitable have the soil and climate proved to be.

When properly cared for and fertilized some of the native orange trees produce fruits unexcelled in point of flavor and juiciness, bearing little resemblance to the very indifferent specimens often found in the markets, which have been picked green, dumped into casks without curing, and sent into the market.

These facts are in striking contrast with the statistics, showing that between \$50,000 and \$60,000 worth of citrus fruits were imported into Honolulu alone in the year ended January 27, 1905. Considerable quantities have also arrived at the ports of Hilo and Mahukona direct from San Francisco. These circumstances have seemed to make it desirable to give a statement of common practices in citrus culture, with special reference to their application to Hawaiian conditions."

A comprehensive description of the cultivation of the orange then follows, special attention being given to budding and graft-

ing, layering, planting, tillage, irrigation, fertilization and pruning. A practical description of gathering, packing and marketing the fruit is also given, together with accounts of insects and other diseases and their approved remedies. After treating of the orange, the lemon, "Pomelos, Grapefruits and Shaddocks" and the lime are accorded due notice. The article comprises Bulletin No. 9 of the local experiment station, is illustrated, and should be read by all who grow citrus fruits in Hawaii.

LIZARDS.

To show how the lizard may be a friend to the apiarist, I will describe a few instances. For two or three months last summer there was a lizard which came into the house regularly between noon and 1 o'clock to catch flies and ants from the floor. There was a very industrious nest of ants located about 30 feet from the house, which formed a black line of foragers to the porch, and went up one of the porch posts and down a wire into our wire-screened safe for fruit. I put tar on the wire, and then they marched in across the kitchen floor to a can of honey that was there for use on the table. Whenever honey was drawn into a dish a little would stick to the cap, and thus attract the ants. I noticed that when the lizard caught a fly, it always turned and picked up from two to four ants, so I made him welcome. At the end of five or six weeks the ants seemed to be entirely cleaned out.

At another time an open five-gallon can of granulated honey was set on the stove to melt. A coarse cloth was thrown over it to keep robber bees out. The honey boiled up suddenly on one side and oozed through the meshes of the cloth. As I was at the dinner-table at the time, the honey was set off the stove on the floor a few feet from my chair, and about a dozen flies and five or six robber bees pounced upon the oozed honey at once. The lizard came in as usual, and immediately hopped upon the cloth among the bees and flies, and, after catching a dozen flies and not molesting a single bee, it climbed down as quietly as it came in and disappeared out the door.

Although these lizards eat house-flies and ants, yet they prefer the large flies, spiders, cockroaches, crickets, moths, canker and cut worms, and grasshoppers, all of which I have often seen them catch.—Writer in *Gleanings*.

REPORT OF THE SUPERINTENDENT OF ENTOMOLOGY.

March 7, 1906.

Board of Commissioners of
Agriculture and Forestry
of Hawaii.

Gentlemen:—Since my report to you, dated February 7th, I have the following additional agricultural, horticultural quarantine work made by Mr. Austin and me. During the above stated time we have visited thirty (30) steamships and sailing vessels entering this port from outside the Territory, on which we have found seventeen (17) cases and boxes of trees and plants and two (2) bales of trees and six thousand six hundred and ninety-two (6692) packages of fruits and vegetables, principally from the coast. Forty-three packages of plants and seeds by mail. The tree imports consisted of orange, lemon, grape-fruit and lime, on which we found a few larvae of "black scale" (*Saissetia oleae*) and "cottony cushion scale" (*Icerya purchasi*). The trees were thoroughly fumigated with hydrocyanic acid gas. In deciduous trees was one large case of peach and plum trees from Florida, two trees were attacked by the Eastern "peach root borer," *Aegeria citiosa*, which we dug out and have in the office as exhibits. One bundle of five plum trees were found to be affected with a fungus disease attacking the twigs, which were confiscated. In fruit we returned six cases of grape fruit infested with *Lepidosaphes beckii*; we destroyed by burning ten boxes of apples badly attacked by "apple scab fungus" (*Fusicladium dentriticum*). One basket of oranges from Pago Pago was not permitted to come ashore. One rose bush by mail was badly affected with a fungus disease. The owner was notified, after viewing it she consented to its destruction by burning. Three (3) large cases, one thousand (1000) plants of New Zealand flax plants (*Phormium tenax*) were imported and each individual plant carefully examined and then fumigated with hydrocyanic acid gas, the cases and packing were also fumigated; we did not find any insects or disease. This is a fiber plant and quantities of the fiber in bales is brought on each steamer from New Zealand entering San Francisco. Mr. Byron O. Clark of Wahiawa, intends testing it to see if it cannot be profitably grown on these

Islands. As it requires more moisture and better land than sisal I doubt if it will be as profitable as that plant.

Quite an importation of choice California grape vines was made by Mr. Isoshima to be planted at Wahiawa; no insects were found, but in order to be safe we make a practice of fumigating all grape vine stock with carbon-bisulphide, so that vapor was administered to this importation.

Several colonies of lantana destroying insects have been sent out.

Mr. Muir, beneficial insect collector of the Hawaiian Sugar Planters' Association, sent from Fiji a colony of a large "lady-birds" (*Synonche* sp.). They were placed in charge of Mr. Kotinsky, and Miss E. Dayton attends daily to feeding them with aphids, which they greedily devour. They are breeding freely, having passed through the various stages from egg to pupae and as soon as we have native-raised adults will liberate them out of doors.

Mr. Kotinsky and I have twice visited the district where it was reported that a borer was at work destroying the young living branches of the Algeroba trees; we made a careful examination but failed to discover any borers. The gentleman showed us where he cut the branch, but we could not find any insect. In a near by wood shed we examined the algeroba wood where we found one native borer, species of Bostrichid, just entering a stick of wood. This beetle only attacks wood that is beginning to sour after cutting, so I don't look for it ever becoming a pest in growing trees.

On February 27th the S. S. "Nippon Maru" brought a large shipment of grape cuttings for the Federal Experiment Station from the San Joaquin Valley, California, which we took the precaution to fumigate, as they were from a district that is known to be infested with the "grape vine hopper" (*Erythroneura vitis*). This is a very serious pest and breeds rapidly and hibernates in the perfect state so the fumigation would reach any that would have been present on the cuttings.

Mr. Hughes, the Master Car Builder of the Oahu R. R. Co., reported to me the existence of a serious pest attacking the hard wood timbers and finishings of some of their passenger cars. On the 6th inst. Mr. Austin and I visited the car department and found the pest to be Termites, and I prescribed the injection of carbon bisulphide into the infested parts, also gave them the in-

formation regarding the necessity of care in its application to keep all lights or fire from the neighborhood of the parts while it was fresh.

One of our liner steamers had its cabin wood work attacked in a similar manner, which on my recommendation was treated with the above remedy, that effectually stopped their depredations.

Respectfully submitted,

ALEXANDER CRAW,

Supt. of Entomology and Inspector.

THE VALUE OF THE GOAT.

Writing on the subject of the common (not the Angora) goat, a correspondent at Nikenbah, Maryborough, says:—"I am aware that the common goat does not, as a rule, command the sympathy of the general public, but let me show how these animals can be of great use to the settler on new scrub lands.

"I felled two pieces of scrub, each of about 20 acres, nearly at the same time. The timber on each block was burnt off about six months ago. On one of the cleared portions my goats were allowed to roam at will, with the result that to-day there is scarcely a sucker of new growth or a weed to be seen. On the second block, which was protected from the goats, the new timber growth is 3 or 4 feet high, and would cost at least 15s. an acre to bring it to the condition of the other piece on which the goats browsed."—Queensland Agriculture Journal.

RABBIT DESTRUCTION BY DISEASE.

A systematic investigation is about to be undertaken in New South Wales to investigate the possibility of dealing with the rabbit pest by means of introducing a contagious disease. Funds are already at hand for the purpose and the experiments are to be undertaken by Dr. Danysz. The annual loss to Australia from rabbit depredation is enormous, and if the attempts at control are only partially successful it is anticipated that a distinct gain will be attained as the sums expended every year upon wire netting are a great tax upon the landowner.

It is satisfactory to know that Dr. Danysz gives the most positive assurance that his methods will be harmless to sheep, birds and other animal life.

BANANINE FLOUR AND BREAD.

Referring to the West Indies, the *Colonizer* in its issue of January, 1906, states that remarkable strides are being made in systematic attention to agriculture, the culture of tropical products, and the development of new ones; and that this advance is due largely to the initiative and splendid work done by the Imperial Department of Agriculture in those islands, and by the West India Committee in England. The writer of the article goes on to mention one important industry which is entirely of today—"Bananine"—a product of Jamaica.

"Bananine" is a flour product derived from the banana. The natives of Central Africa manufacture a crude flour from this fruit; and speaking of this, the late Sir H. M. Stanley said, that if only its virtues were publicly known, it would be largely consumed, especially by infants, persons of delicate digestion, dyspeptics, and those suffering from temporary derangement of the stomach.

The flour now placed upon the market under the name "Bananine" is far superior in quality to the native-made product, and possesses a higher value as food than even beef, containing, as it does, as high a percentage of proteids, whilst its caloric or energy value is almost four times as great.

"It is from this product," says the *Colonizer*, "that is derived the now well-known 'Bananine' bread—the result of practical and scientific experiments carried over a considerable period—possessing all the qualities of a perfect food, combined with pleasant appearance and flavour. The nutritive properties of 'Bananine' bread are present in the most easily available form of assimilation, and are certainly appreciated by those suffering from dyspepsia and other forms of digestive disorders. It appears as palatable and digestible when freshly baked as when several days old, nor does it become dry even after keeping. It is certainly not a luxury, but an everyday article of food, at a price within the reach of all, and has a pleasant flavour similar to that of the best wholemeal bread."

HONUULA FOREST RESERVE.

Following the usual custom of the Board, there are given below the resolution adopted by the Board of Agriculture and Forestry regarding the proposed Forest Reserve on a part of the government land of Honuaula, North Kona, Hawaii, with the reports of the Superintendent of Forestry and of the Committee on Forestry upon the project.

Acting Governor A. L. C. Atkinson has called a public hearing on April 4th, 1906, to consider the setting apart of this area, and it is expected that soon after that date he will issue a proclamation creating it a forest reserve.

RESOLUTION IN REGARD TO THE PROPOSED HONUULA FOREST RESERVE.

Adopted by the Board of Commissioners of Agriculture and Forestry on March 7, 1906.

Resolved, That all that certain piece of Government land on the Western slope of Mount Hualalai, on the Island of Hawaii, bounded on the south by the land of Puaa 1, on the east and north by the portion of Honuaula now covered by Lease No. 570 of the Territorial Land Office, and on the west by a line drawn from Puu Lae Koa to a point on the Puaa boundary a little below Puu Laalaaui, in the District of Kona, Island of Hawaii, as recommended by the Committee on Forestry, on January 9, 1906, based on a report of the Superintendent of Forestry, dated January 8, 1906, as more particularly appears by and on a map and description now on file in the office of this Board, and made a part hereof, be approved as a forest reserve, to be called the Honuaula Forest Reserve.

Resolved. That the Board recommends to the Governor that the said described Government land, within the boundaries of the said proposed Honuaula Forest Reserve be set apart by him, after the hearing required by law, as the Honuaula Forest Reserve.

REPORT OF THE COMMITTEE ON FORESTRY UPON THE PROPOSED HONUULA FOREST RE- SERVE, NORTH KONA, HAWAII.

Honolulu, T. H., Jan. 9, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—Your Committee on Forestry has had under consideration the question of the Territory regaining possession of

the Koa forest on the land of Honuaula, North Kona, Hawaii, and the setting apart of this area as a forest reserve.

On general principles your Committee does not approve of the construction of forest reserve fences out of the funds of the Board, but as this case is one out of the regular order and as the necessity for fencing comes about because of action taken by a former administration, before the organization of the Division of Forestry, a matter over which the Board had no control, we recommend that the action of the Superintendent of Forestry be approved; it being, however, understood that this recommendation is not to be considered as a precedent for future action.

Your Committee approves the recommendation of the Superintendent of Forestry that the forest area on Honuaula be made a forest reserve as soon as the necessary description shall be obtained.

L. A. THURSTON,
Chairman.

W. M. GIFFARD,
ALFRED W. CARTER.

REPORTS OF THE SUPERINTENDENT OF FORESTRY UPON THE PROPOSED HONUAAULA FOREST RESERVE, NORTH KONA, HAWAII.

Honolulu, Oahu, January 8th, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I beg to submit herewith a report upon the proposed Honuaula Forest Reserve in North Kona, Hawaii, and to recommend that the Board approve the suggestion made herein.

As the problem of creating this reserve has been a somewhat complicated one, a brief review of the matter may not be out of order. The land of Honuaula lies on the western slope of Mt. Hualalai, in the District of North Kona, Island of Hawaii. It extends from the West Peak of Hualalai to a line approximately parallel to the Government road, about $1\frac{1}{2}$ miles mauka of it. The lower portion of Honuaula was laid out some years ago in homestead lots which have never been opened up. This part of

the land was formerly covered with forest, made up of Ohia Lehua and the various small trees characteristic of the lower elevations. In spots were dense masses of Ie-ie vine. With the running of the homestead lot lines cattle had access to the forest and have since worked back and forth until the forest is now open. Above the homestead tract is a strip of open grazing land, while again above this is a belt of Koa timber of large size and excellent quality. This is the area which it is desired to make a forest reserve. Next to the Bishop Estate land of Keauhou it contains the best stand of large-sized Koa that I have seen anywhere in the Territory; certainly the best on government land. As such it has been my constant endeavor since first seeing it to have it set apart as a forest reserve. Above the belt of Koa, Honuaula runs up in a point to Hualalai, this portion being open grazing land, with a scattering of Mamani trees just above the Koas.

The portion of Honuaula above the homestead lots was formerly under lease to Mr. John A. Maguire. This lease ran till July 10, 1904, but at Mr. Maguire's request it was put up at auction under the two year clause on July 29, 1903, at which time he was out-bid by Messrs. J. G. Henriques and Frank Gomes. Mr. Maguire obtained a six months' extension so that the lease to Messrs. Henriques and Gomes took effect from Jan. 10, 1905. The lease calls for 3044 acres—the annual rental \$610.00. This action took place during Governor Dole's administration.

In February, 1904, Mr. J. W. Pratt, Commissioner of Public Lands, referred the matter to the Board with a request for recommendations. I had visited the land in February, 1904, and after another visit, made in June, 1904, I recommended to the Board that if possible an arrangement should be made through the Commissioner of Public Lands, to cancel the lease, that the land be retained as a forest reserve. The Board approved my report on June 29th, 1904, and so notified Mr. Pratt, who then referred the matter to the Attorney General. But it was ruled by him that the lease could not be cancelled. Accordingly the lease was signed and delivered to Messrs. Henriques and Gomes on Jan. 10, 1905.

At the same time, as I was still anxious to secure the belt of Koa forest as a reserve, Mr. Pratt agreed to make a pro rata reduction in the rental if Messrs. Henriques and Gomes would surrender a portion of Honuaula. To this they assented and accord-

ingly in June, 1905, with Mr. S. M. Kanakanui, of the Survey Office, I visited North Kona to fix on the ground the boundaries of the area to be given up. As a condition of this surrender it was agreed that the Board build and maintain a fence around the area to be given up. This amounted, all told, to about ten miles. Although no formal action was taken by the Board, I discussed the matter with various members and was authorized to go ahead with the arrangement, which I did; contracts being let for the purchase of wire and for building the fence. The wire was delivered and is now stored at the Government Nursery. The area of Koa forest cut out by Mr. Kanakanui, after consultation on the ground with Messrs. Henriques and Gomes, was 1,090 acres. After the lines had been run Messrs. Henriques and Gomes refused to agree to the terms of reduction offered by Mr. Pratt, standing out for certain propositions which could not be considered. The fencing contract was accordingly cancelled, a provision for doing so, in case of need, having been included therein.

In the meantime Mr. Pratt had announced his intention of leasing the lower part of Honuaula, including the old homestead tract. This opened a chance for further negotiations on which I have been working at intervals during the last six months. In December, 1905, Messrs. Henriques and Gomes came forward with a modification of the original proposition of a pro rata reduction, whereby some 1,300 acres, containing the best part of the Koa forest and also the triangular area of open land running up to the peak of Hualalai were to be surrendered by them, provided the Board agreed to fence the line separating the reserve from the part of Honuaula retained by them, a matter of about two miles. Mr. Pratt agreed to this proposition so far as the reduction of rental was concerned, and as the cost of fencing the two miles was so very much less than I had been authorized to incur in the summer, especially as the wire was already in hand, I agreed for the Board.

Messrs. Henriques and Gomes had an alternative proposition that the Board buy out their lease-hold, but this proposition was not one which could be considered. It need not be discussed here.

Of the 1,300 acres surrendered by Messrs. Henriques and Gomes a portion, the exact area of which I do not now know—perhaps a third of the whole—is the open land above the Koa belt before referred to. I have arranged with Mr. Pratt to lease

this upper section with the provision that a fence be built along the top of the Koa forest. This area separates two lands controlled by Mr. Maguire, and is of value to him as a connecting link. Mr. Maguire has expressed his willingness to be a bidder for the land on the terms named. This takes care of fencing three sides of the reserve. On the fourth, the south side, it adjoins Puaa 1, a narrow strip now belonging to the Bishop Estate. I am in communication with Mr. Dodge and Mr. Maguire, who owns the land beyond, in regard to the matter and think that it can be arranged by utilizing existing fences, to enclose this side at a very small cost.

While I do not approve of the policy of this Board agreeing to build and maintain the fences around the forest reserves, I do believe that this case is a justifiable exception. As has been pointed out Honuaula is a legacy from a former administration, which came to the Board outside of the regular channels. After several attempts and much labor a workable solution has been arrived at. By the construction of about two miles of fence—the wire for which is already in hand—there can be secured as a reserve an area of valuable forest containing what is, so far as I know, the best stand of large sized Koa on any government land in the Territory; almost as large an area, in fact, as was to have been secured by the ten miles of fencing authorized last summer.

Therefore in view of the benefit to the district from the continuance of a forest belt on the mountain, of the danger which results when a forest like that on Honuaula is subjected to grazing, and especially because of the increasing market value of Kōa and the development of Koa lumbering on Hawaii,—which will, I trust, in time lead to the proper utilization of this forest,—I recommend that the Board approve the action taken by me and further that it recommend to the Governor the reservation of the area as a forest reserve.

The technical description of the area will be submitted in a supplementary report, one or two points in the new boundary having yet to be fixed. This will be done within a short time by Mr. F. E. Harvey of the Survey Office, who expects to visit Kona for this and other work on January 19, 1906.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Honolulu, Oahu, March 7, 1906.

To the Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—On January 9th, 1906, the Committee on Forestry, reported favorably upon a report of mine, dated January 8th, 1906, having to do with the reservation of a portion of the land of Honuaula, North Kona, Hawaii, as the Honuaula Forest Reserve. Action by the Board on this proposed reserve was, however, postponed until a description of the area to be reserved should be prepared.

I have the honor to submit herewith a technical description prepared by Mr. F. E. Harvey of the Survey Office, and to recommend that the Board adopt a resolution favoring the reserve, when the matter can be brought to the attention of the Acting Governor to take the regular course. A form of resolution accompanies this letter.

The description is as follows:

Honuaula Forest Reserve, North Kona, Hawaii.

Beginning at the Southeast corner of this reserve, marked by a 3" pipe with a target on Top, marked F. R. T. H., and large ahu, on the boundary of Puaa 1 and Honuaula, true azimuth and distance from Government Trig. Station, Puu Laalaau, being $61^{\circ} 32' 17''$ distance 960.3 feet as shown on Government Survey Registered Map No. 1972, and running by true azimuths:

1. $61^{\circ} 32' 17''$ 4319.7 feet along land Puaa 1, to a 3" pipe and target marked F. R. T. H.;
2. $137^{\circ} 22' 15''$ 6871.9 feet along makai portion of Honuaula to a 3" pipe and target marked F. R. T. H.;
3. $223^{\circ} 00' 00''$ 3549.0 feet along remainder of Honuaula to + on stone, pipe with target marked F. R. T. H. and large ahu;
4. $312^{\circ} 50' 30''$ 8225.4 feet across mauka portion of Honuaula to the initial point.

Area 665.0 Acres.

FRED E. HARVEY,
Assistant Government Surveyor.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE EWA, WAIANA
E AND WAIALUA DISTRICTS, ISLAND OF OAHU.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands in the Ewa Basin, on the Island of Oahu, bounded on the Southwest by approximately the lower edge of the existing forest, on the Northeast by the crest of the Koolau Mountains, on the East by and including the land of Halawa, District of Ewa, and on the West by and including the land of Wahiawa, in the District of Waialua, in the Districts of Ewa, Waianae and Waialua, Island of Oahu, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a point on the present boundary fence between the Ahupuaas of Halawa and Moanalua, which point is distant 10,425 ft. N. $61^{\circ} 15'$ E. from the Government Survey Trig. Station "Salt Lake" and from which the Honolulu Plantation Company's Mill Stack bears N. $86^{\circ} 12'$ W. Said point is on a rocky peak overlooking the South branch of Halawa Valley and is marked by a "Forest Reserve Monument," Approximate elevation 800 ft.;

Thence N. $50^{\circ} 02'$ W. 4754 ft. across South branch of Halawa Stream to flat top knoll between the North and South branches of Halawa Stream which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. $34^{\circ} 15' 30''$ W. and the Honolulu Plantation Company's Mill Stack bears S. $80^{\circ} 20' 30''$ W., Approximate elevation 925 ft.;

Thence N. $59^{\circ} 58' 30''$ W. 4177 ft. across the North branch of Halawa Stream to a point on saddle in ridge overlooking Aiea Stream, which point is approximately on the boundary between the Ahupuaas of Aiea and Halawa and is marked by a "Forest Reserve Monument + " and from which "Salt Lake" Δ bears S. $10^{\circ} 28'$ W. and the station of the Aiea-Halawa boundary known as "Pooholua" bears N. $55^{\circ} 01'$ E. 660 ft., Approximate elevation 900 ft.;

Thence N. $28^{\circ} 15'$ W. 2411 ft. across Aiea Stream to a point on knoll 480 ft. from the present Aiea-Kalauao boundary fence, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. $3^{\circ} 26'$ W. and the Honolulu Plantation Company's Mill Stack bears S. $48^{\circ} 50' 30''$ W., Approximate elevation 930 ft.;

Thence N. $41^{\circ} 14' 30''$ W. 2075 ft. across Kalauao Stream to a point on knoll on South side of Waimalu Stream, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 2°

37' E. and the Honolulu Plantation Company's Mill Stack bears S. 36° 29' W., Approximate elevation 960 ft.;

Thence N. 50° 48' 30" W. 3737 ft. across Waimalu Stream to a point on ridge on N. side of Waimalu Stream, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 12° 17' E. and from which the Honolulu Plantation Company's Mill Stack bears S. 15° 47' W., Approximate elevation 970 ft.;

Thence N. 41° 14' W. 3651 ft. across Punanani Stream to point on present boundary fence between Ahupuaas of Waiau and Waimalu and which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 17° 25' 30" E. and "Diamond Head" Government Trig. Station bears S. 34° 25' E., Approximate elevation 985 ft.;

Thence in a Northeasterly direction, along the Waiau-Waimalu boundary 6195 ft. to the present forest reserve fence;

Thence Northwesterly in an irregular line along the present forest fence across the lands of Waiau, Waimano, Manana, and Waiawa, to the top of hill called Puu Kamanu, which is a boundary point between the lands of Waiawa and Waipio, and is marked by two triangular pits Δ ;

Thence Westerly and Northwesterly along the present forest fence across the land of Waipio to the boundary between Waipio and Waianae Uka at a point from which "Ahunui" boundary mark on Eastern side of Grant 6, is distant 10,380 ft. in a Southwesterly direction along said boundary;

Thence in a Northwesterly direction across Waianae Uka to the concrete post at the East end of the Wahiawa homestead tract as shown on Government Survey Registered Map No. 1941;

Thence crossing the land of Wahiawa by the following bearings and distances as shown on Government Survey Registered Map No. 1942, N. 24° 25' E. 3753 ft. to R. W. Post, N. 22° 26' E. 600 ft. to R. W. Post, N. 69° 44' W. 4860 ft. to R. W. Post, N. 59° 50' W. 1760 ft. to R. W. Post on the South side of Poamoho Gulch;

Thence running along the Ahupuaa of Paalaa, as shown on Government Survey Registered Map No. 1942, N. 82° 20' E. 1603 ft. to rock marked +, N. 81° 5' E. 25,130 ft. to the top of the Koolau Range of Mountains;

Thence Southeasterly along the top of the Koolau Range, being the upper boundary of all the Ahupuaas included with this "Forest Reserve," to the boundary between Halawa and Moanalua;

Thence Southwesterly along the boundary of Halawa and Moanalua to the point of beginning; excepting therefrom such portions of the lands in the valleys as may be below the 650 foot contour lines.

Area 28,550 acres, more or less.

AND I do hereby set apart as a Forest Reserve those portions of the Government lands known as the mauka portion and unleased remainder of the land of Waimano, (above the area described more particularly in Public Lands Office Lease No. 510), and the land of Wahiawa (government), (more particularly described in Public Lands Office Lease No. 530, granting the water rights thereon), within said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal) Done at the Executive Building, in Honolulu, this 9th day of March, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE PUNA DISTRICT. ISLAND OF KAUAI.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands comprising the mauka part of the North end of the District of Puna, above a line drawn at approximately the lower edge of the existing forest across the lands of Anahola, Kamalomaloo, Kealia and Kapaa, in the District of Puna, Island of Kauai, Territory of Hawaii, more particularly described as follows, viz:

Beginning in the land of Anahola at a + on a stone at a place called Paepae, elevation of 281.0 feet; azimuth and distance to N. B. being 239° 50' 54.15 ft. and running by true azimuths:

1. 3° 14' 3631.0 feet to place called Panikioi; elevation 348.0 feet;
2. Thence to the North bank of the Anahola river and following the North bank, and up bluff to a place called Kiokala marked by + on a stone, the direct azimuth and distance being 99° 55' 30" 9625.8 feet;
3. 38° 51' 30" 2987.8 feet to a pipe set at the boundary of Anahola and Kamalomaloo at a place called Kamana, elevation 643 feet;
4. 21° 24' 30" 4697.9 feet across land of Kamalomaloo to an iron pipe on boundary of Kealia and Kamalomaloo, elevation 664.0 feet;
5. 25° 41' 3192.6 feet to pipe in summit of Puu Kinui in land of Kealia, elevation 980.0 feet;
6. 350° 34' 2821.7 feet across Mimino Gulch to pipe in Puu Lawii in boundary of Kealia and Kapaa, elevation 852.0 feet;
7. Thence down the slope to foot of ridge and running in a Westerly direction skirting the base of the mountains, crossing Kapahi Stream and up to Moalepe Gulch in vicinity of a place called Pohakiikii, thence up bluff to an iron pipe in the boundary of Kapaa and Waipouli, direct azimuth and distance is 58° 56' 14.487.9 feet; thence following the watershed of the ridge being the boundary of Kapaa and Waipouli, the direct azimuth and distance being:
8. 100° 21' 30" 4031.0 feet to an iron pipe at Kainamanu, elevation 1143.6 feet;

9. $124^{\circ} 12'$ 1724.1 feet to an iron pipe at Kahilimalani, the head of the land of Waipouli and the boundary of Oloheua;

10. Thence up watershed of ridge along land of Oloheua to pipe at head of land of Oloheua at place called Pehuaola, direct azimuth and distance being $180^{\circ} 59'$ 5544.9 feet and elevation 3211.0 feet;

11. Thence following the watershed of the ridge and along the lands of Wailua and Kalihiwai to Makaleha the Northwest corner of Kapaa and Southwest corner of Kealia direct azimuth and distance being $183^{\circ} 48'$ 4427.7 feet;

12. $223^{\circ} 57'$ 1969.0 feet along Kealia and Kalihiwai following the ridge to Tiptop, elevation 2710.0 feet;

13. $177^{\circ} 21'$ 1419.0 feet along Kealia and Kalihiwai following the ridge to Pueo marked by an iron pipe, the Northwest corner of Kapaa and the Southwest corner of Anahola, elevation 2410.0 feet;

14. $141^{\circ} 20'$ 1537.0 feet along Anahola and Kalihiwai following the ridge to Last Peak at an elevation of 2410.0 feet;

15. $146^{\circ} 42'$ 6526.1 feet along Anahola and Kalihiwai following ridge to Kokoiki marked by a pipe at the Northwest corner of Anahola, elevation 2500.0 feet; thence by survey of Jas. W. Gay of Anahola,

16. $267^{\circ} 20'$ 4092.0 feet to Peak;

17. $249^{\circ} 00'$ 726.0 feet to top of Peak;

18. $273^{\circ} 00'$ 5214.0 feet to top of Malamalamaiki Peak;

19. $245^{\circ} 15'$ 6732.0 feet along ridge;

20. $256^{\circ} 00'$ 1254.0 feet to Keeaoopuu where old road crosses range;

21. $236^{\circ} 15'$ 4356.0 feet along ridge to bend in ridge;

22. $351^{\circ} 00'$ 1386.0 feet along ridge;

23. $332^{\circ} 30'$ 891.0 feet along ridge to Puukeakea;

24. $286^{\circ} 20'$ 2442.0 feet along ridge;

25. $281^{\circ} 00'$ 1452.0 feet along ridge to Puu Eu, the highest Peak, elevation 1932 feet;

26. $290^{\circ} 00'$ 4158.0 feet along ridge to Keaweumakua;

27. $292^{\circ} 00'$ 2772.0 feet to a pipe and large ahu on summit of Kikoo, elevation 1477.0 feet;

28. $253^{\circ} 18'$ 3368.0 feet down face of ridge;

29. $351^{\circ} 30'$ 862.0 feet to initial point.

Area 9935.0 Acres.

AND I do hereby set apart as a Forest Reserve those portions of the Government lands known as Anahola, Kamalomaloo and Kapaa, within said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal) Done at the Executive Building, in Honolulu, this 9th day of March, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

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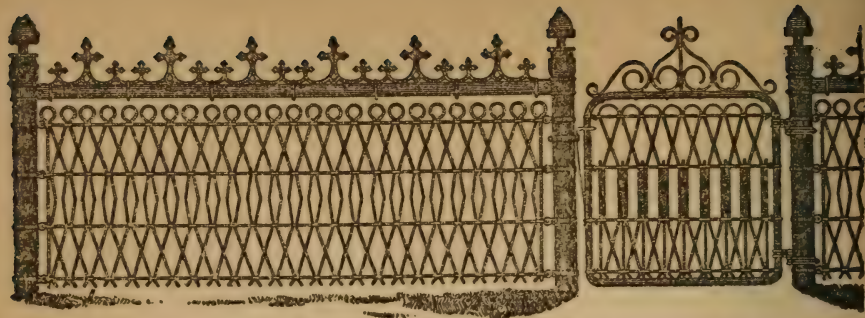
"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When possible, the collection of such insects will

THE HAWAIIAN FORESTER AGRICULTURIST

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APRIL, 1906

No. 4

Few countries are so well provided with the means to investigate and combat the difficulties arising from insect depredations, as Hawaii. No less than three excellent institutions, representing the Federal and Territorial governments and the Sugar Planters respectively, possess laboratories equipped with modern facilities for entomological work, and presided over by properly trained entomological experts. By means of these a vigilant warfare, which is gradually and encouragingly reducing the dangers which threaten the agricultural prosperity of the Islands, is carried on. The chief work of these laboratories and stations has centered around the solution of problems connected with insect ravages of sugar cane and other plantation crops, and has been chiefly observable in field work. Investigations of such practical utility as those to determine the possibilities of establishing the production of silk in Hawaii, have also been undertaken and have been rewarded with success. Of the more tedious laboratory work, entailing much original research and long series of systematic experiment, the general public has known little, but it has contributed generously to the welfare of our Islands by helping to render our plantation crops more immune from destructive insect and other agencies.

Well as this country is provided in this respect, there is still an opportunity for entomological utility in a direction at present not attended to. However adequately the enormous interests involved in the safeguarding of our plantation crops are defended, our gardens are beset by such insect enemies as have not been overcome by efforts mainly directed to larger issues. There is no doubt that without the excellent work of our entomologists in the past, few citrus or other fruit trees in the Islands would be free from insect pest or fungoid blight of some kind. Yet in many cases after the destructive agencies have been in general overcome, colonies of the pest have remained in out of the way situations, from which they have spread as opportunity presented itself. The necessity now arises of eradicating from

small lots these isolated breeding places, which are often responsible for the loss of the entire fruit crop. It is safe to say that there is hardly a house lot of any size in Honolulu which possesses a few fruit trees, some of which have not been rendered useless and unsightly from insect or fungoid pest. Often these colonies are in a more or less dormant condition, or at most, in such a balance that they remain comparatively quiescent during part of the year, to awake to full activity whenever the infested tree attempts to put forth new leaf or blossoms. At these seasons their depredations are sufficient to destroy all development. Many valuable trees are thus rendered unproductive and many unsightly blots are left to mar the appearance of those plants which are sturdy enough to resist attack. In few cases do the colonies appear sufficiently vigorous to spread their destruction to other localities, their development beyond narrow limits being probably due to the success of the methods of check already alluded to.

To a householder possessing infested trees, two alternatives offer. Either he must allow the undesirable condition of affairs to continue indefinitely, thus losing a great portion of his crop and tolerating an unsightly appearance during most of the year, or he must himself actively combat the pest with such means and knowledge as are at his disposal. The local entomologists have done much good and efficient work by disseminating in a readily obtained and untechnical form the knowledge of the most approved methods of dealing with insect pests, but however efficient these may be in the hands of an expert, the average business man has often little opportunity to use, or inclination to invest in apparatus, the working of which he does not understand and which would be so seldom used. To meet this condition of affairs and to place a ready means to destroy these pests at the disposal of all who care to avail themselves of it, it would seem an excellent opportunity for some business house dealing in garden supplies to employ a practical man and to teach him, under the direction of one of the local entomologists, the necessary proficiency in the use of insect sprays and washes. In this way, by payment of a reasonable fee, the operation could be held at the disposal of such lot owners as desired infested areas to be treated, and many valuable trees could be cleaned and rendered productive, and many spots, now unpleasing to the eye, could be rendered beautiful.

ENTOMOLOGICAL NOTES

From the Division of Entomology, Board of Agriculture and Forestry.

BY JACOB KOTINSKY.

A NEW BOOK AND LEATHER PEST, (*Catorama Mexicana* Cher.)

This is a dark brown, chunky little beetle measuring about one-tenth of an inch in length and is covered with very fine silky hair. The grub or larva of this beetle is of about the same length, cream colored, with shiny head and dark mouth parts, quite fussy looking and is usually curled up in its hiding place. From literature at hand it seems that little was known of the destructive habits of this insect. In 1885 Blackburn reports it as "common on Maui, in houses and in decaying trees near sea level." Its very name implies that it comes to us from Mexico. The identity of the species in both the cases cited below has been positively determined by Mr. Perkins. In this Territory the writer has bred it from grubs dug out of books in a glass door case in Kona, Hawaii, which they had invaded. More recently the attention of this office was called to serious damage in expensive leather goods in a store house on Kauai. During a recent visit to this Island the writer had the privilege of ripping open one of the invaded horse collars in this store and found the beetle in various stages feeding upon the straw stuffing. The outward indications of an attack by this beetle are small, perfectly round perforations, some of which are filled with the fine yellowish dust produced by them or are empty and the dust heaps may be found immediately below the object. This dust serves as a guide to detect its presence in books, showing no outward signs of damage. It is safe to conclude from its habits thus far observed that it is a general pest in store houses and book cases and as soon as its presence is detected the measures indicated below should be taken to exterminate it. The habits of the insect will also indicate how it was imported into this country.

REMEDIES.

"An ounce of prevention is better than a pound of cure." The most effective preventives of depredations by this insect is cleanli-

ness. Any portion of the store-house left unswept for a length of time forms a breeding place for pests of this nature. It is good practice to periodically transfer piled stocks of wares from one place to another that has been thoroughly swept and white-washed with a mixture of lime and kerosene. Frequent dusting of books and book cases will disturb these insects and prevent their activity among them. One of the sources for infestation of household or store-house with any pest is the source of supply like grocery stores, drug stores, and other warehouses from which goods are bought. It should, therefore, be the care of the store and housekeeper to examine materials with an eye to detect the presence of injurious pests.

Once a covered book case or store house has been invaded and if repeated cleaning fails to produce the desired result of checking injury by this and smaller pests, we are obliged to resort to drastic measures. One of the most effective checks is fumigation by means of carbon-bisulphide. This substance is an ill smelling liquid, procurable in drug stores, which evaporates in ordinary temperature and, therefore, feels cold to the touch, and the vapors are heavier than air. It should also be borne in mind that *the substance is extremely inflammable and must, therefore, be kept away from fire of any kind.* While it is not instantly fatal to man, it is advisable to inhale as little of it as possible. The vessel which may be either the present container of the objects to be fumigated or specially constructed boxes or chambers in which the fumigation is to be done, should be made as nearly air-tight as possible, particularly so at the bottom. The liquid, which is to be used at the rate of 1 pound to about one thousand cubic feet, is best poured out into shallow vessels which are placed as near the top of the fumigation chamber as possible. The objects to be fumigated being placed below, packed loosely. The chamber should be closed immediately after the liquid is poured out and left closed for at least twenty-four hours. It is then opened and by means of a natural or artificial drafts thoroughly ventilated and invariably the pests are found dead. In case of bad infestation a repetition of this operation may be necessary at the end of a couple of weeks, as the eggs may not be killed by the fumes, and we must depend upon killing the larvae that hatch from them subsequently.

ROUTINE REPORTS OF THE DIVISION OF FORESTRY.

The following three reports were read by the Superintendent of Forestry at the meetings of the Board of Agriculture and Forestry, held on March 7 and 22 and on April 4, 1906:

REPORT OF MARCH 7, 1906.

To the Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith the report of the Division of Forestry for the period from February 7th to date, the last meeting of the Board having been held on February 7th.

FOREST RESERVE.

Owing to the illness of Governor Carter the public hearings in regard to the Kealia and Ewa Forest Reserves were not called until March 7th. The description of the boundaries of the proposed Hanuaula Forest Reserve, North Kona, Hawaii, was received from the Surveyor on Feb. 21st and forms the subject of another letter to the Board, under the date of today.

On Feb. 23 I went over to the District of Hana, Island of Maui, to look into the forest situation there and to fix a forest line across the district; the latter work in response to a request from the Commissioner of Public Lands, made some time ago. I have submitted to the Committee on Forestry a preliminary report upon a proposed forest reserve in Hana, which will later be followed by another report containing a technical description of the boundaries recommended. I returned to Honolulu on March 1st.

ANNUAL REPORT.

The annual report of the Division of Forestry for the year ending Dec. 31, 1905, was submitted to the Chairman of the Committee on Forestry on March 6th. The supplementary reports of the District Foresters are now being copied and within a few days will be ready to go to the printer.

LIST OF SEEDS.

A revised list of the Forest and Ornamental Tree seed for sale at the Government Nursery has been issued as Press Bulletin No. 3, of the Division of Forestry, under the date of Feb. 14th, 1906. This list is now being distributed throughout the Territory.

ADVICE AND ASSISTANCE.

Special attention is called to the report of Mr. Haughs, dated Feb. 27th, 1906, which describes his recent trip to Hawaii, in response to request for advice from persons desiring to establish forest plantations. Planting plans are now being prepared by him to be sent to those who are to do the work. Mr. Haughs returned to Honolulu on Feb. 10th.

Several applications have been received under the terms of Circular No. 1, of the Division of Forestry, and I have been given to understand that others will soon be submitted.

FOREST FIRE NOTES.

In consequence of the forest fire on Tantalus on Feb. 5th, a special fire warning notice was issued by me, as Chief Fire Warden, on Feb. 8th, forbidding the burning of brush, grass, etc., unless the permission of the District Fire Warden has been first obtained, for the period of twelve months from that date.

Mr. W. M. Giffard was appointed Fire Warden on February 7th, and shortly afterward cloth notices giving the special warning were printed and posted on Tantalus. A circular letter has been sent out to each property owner on Tantalus and at the head of Manoa and Pauoa Valleys, calling attention to the special notices and requesting compliance therewith.

On February 13th another fire was reported on Tantalus which called to the scene Mr. Haughs and three laborers, Captain Johnson and some fifteen men, and the Superintendent of Forestry and two of the Commissioners of the Board. The fire proved to be brush, which the Japanese man on Mr. T. Clive Davies' place was burning contrary to Mr. Davies' orders. The fire did not get away and no damage was done, but at noon it looked from town as if a big fire was under way. This led to the despatch of such a large gang of men.

A Forest Ranger (Mr. David Kapihi) has just been appointed for this section of Oahu, whose chief duty will be to look out for and suppress forest fires.

A form of permit for use by the District Fire Wardens during seasons covered by a special warning, has been drawn up and printed. Books containing fifty forms each will be furnished to each Fire Warden for whose District a special notice is issued.

A circular letter has been sent out to each Fire Warden, requesting him to call upon the Chief Fire Warden to issue a special warning at any time when in his judgment the local conditions are such as to require such measures.

On March 4th, Mr. A. M. Nowell, District Forester and Fire Warden for Waialua, notified me that a fire about twenty-five acres in extent had occurred in the section just north of Wahiawa. Fortunately, a plantation luna happened to be at hand with some laborers, and put it out. Otherwise, says Mr. Nowell, it might have spread and become as disastrous as the fire which occurred back of Wahiawa just a year ago.

In accordance with a recommendation from Mr. Nowell, I have issued a special warning notice for a period of six months for the upper part of the District of Waialua. This is published today in the Bulletin.

While on this subject I have the honor to recommend that Mr. John Chalmers of Hana, be appointed District Fire Warden, in and for the District of Hana, Island of Maui, a section that is not now covered.

ROUTINE WORK.

The routine work of the Division has gone on as usual during the past month, as is shown in the reports of the Forest Nurseryman. The new book cases in the library room have been completed, adding much needed shelf room, while a map case in my own office will now permit the proper housing of that collection. The carpenters have also made certain changes and improvements in the Entomological rooms and completed the addition to the stable.

A new style postal collection box has just been installed outside our gate, which will be a convenience.

LIBRARY.

Among the new books recently received may be mentioned the 1905 Yearbook of the Carnegie Institute of Washington, D. C.; publications from the Field Columbian Museum and the U. S. Geological Survey; Vol. IX of the Tenth Census of the United States, containing Sargeant's authoritative "Forest Trees of North America"; publications completing a full set of the technical and other Bulletins of the Bureau of Entomology of the U. S. Department of Agriculture; Kellogg's "American Insects," and the Zoological Record for 1904. Some additional volumes from the old Government Library have recently been turned over to the Board, among which are several valuable publications.

The Library room was used on February 23rd and March 2nd for meetings of the Honolulu Improvement Committee, and on February 8th and March 1st by the Hawaiian Entomological Society.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF MARCH 22, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I have the honor to submit herewith the regular report of the Division of Forestry for the period from March 8th to date.

During this time, the staff of this Division has been busy in connection with revising for publication the Annual Report for 1905, with the preparation of the proclamations declaring the Ewa and Kealia Forest Reserves and other matters in regard to the proposed Honuaula, Kau and Hana reserves.

On March 20th, I personally examined the upper portion of the land of Waianae-kai, with reference to a proposed forest reserve in that section. This valley, with the adjoining land of Lualualei, will form the subject of a report to be submitted in the near future.

In accordance with the suggestion of the District Fire Warden for Ewa, I issued on March 19th, a special warning notice for-

bidding the burning of brush, etc., in the Ewa Basin, for a period of six months, unless the written permission of the District Fire Warden has been first obtained.

LIBRARY.

Among the accessions to the Library during the last fortnight I would call attention to the first number of two important Journals which we shall now receive regularly, the "Philippine Journal of Science," published by the Bureau of Science of the Government of the Philippine Islands, and the "Quarterly Journal of the Institute of Commercial Research in the Tropics," published by the Liverpool University, Liverpool, England.

The Library room of the Board was used for meetings of the Honolulu Improvement Committee on Friday evening, March 16th, and by the Pawaa Improvement Club on March 15th.

FOREST FIRES.

During the last fortnight forest fires have been reported, as follows:

On Sunday, March 11th, a grass fire of about five acres in extent in the upper Palolo Valley, on this Island, was extinguished by Mr. Haughs and a gang of 17 laborers, before it had a chance to get far enough mauka to do any damage. One of the laborers was taken from the Nursery, five more were picked up locally, and the others were Road Board men sent by Mr. Holloway. The fire was started by children playing with matches in the dry grass back of one of the homesteads. For further details regarding it Mr. Haughs' report should be consulted.

On March 7th, a forest fire was reported by Mr. James Gibb, to be burning on the portion of the land of Paauhau controlled by the Parker Ranch. This fire started from a locality where employees of the Parker Ranch were burning ivy. Brush fires for this purpose had been going on for some time and the work was being done under the supervision of Mr. E. E. Conant. This particular fire resulted through the wind which came up suddenly at the time of the recent Kona and carried sparks into the forest. Large gangs of men from both the ranch and the plantation turned out to fight it and by the next day had the fire under control. During the second night a heavy rain came which extinguished the fire. Mr. Conant in his report estimates

the area burned over at 1000 acres. He states that the damage is nominal as the trees burned were mostly dead timber.

Mr. John A. Scott, District Fire Warden for Hilo, reports brush fires on one of the Ponohawaii homestead lots and also on one of the homestead lots on the land of Kukuau Second, back of Hilo Town both of which were got under control before any damage was done to the forest. These fires occurred on March 7th.

Mr. Scott also reports a grass fire that started on the Waiakea beach lands on March 12th. This fire died out when the wind which was spreading it went down. If the wind had not abated, it is quite likely that it would have run in the same direction as did a fire two years ago, which burned over a section of the lower Waiakea forest.

Two other fires on Hawaii have also been reported, both of which started on the 7th of March. One of these was in the vicinity of Puu Oo, at the upper edge of the Hilo Forest Reserve, back of Hilo Town. Of this fire I have not yet learned the details. The other fire started on Pakua Hill near Hilea, Kau, back of the Naalehu plantation. This fire was reported to me by Messrs. W. G. Irwin & Company, who had received word from Mr. C. Wolters, the manager and District Fire Warden. I have since received a report directly from Mr. Wolters. The plantation turned out a large gang of men which, after a hard fight, extinguished the fire on the afternoon of March 8th. Mr. Wolters says that "it was only by great and repeated efforts that the flames were prevented from escaping into the Ninole and Kaalaiki Hills, from whence they would have spread over the whole mountain side."

I have also been informed by Messrs. W. G. Irwin & Company that a fire had been started by some natives who had been burning brush on one of the Kamae homesteads, back of Hakalau plantation, and was only stopped from getting into the forest by the efforts of a gang of 300 men.

On March 20th, a fire was reported by Mr. G. W. McDougall on the land of Honokua, District of Kona. The Board, being unable to order out men to fight this fire, instructed Mr. McDougall to warn the persons on whose land the fire had been started, that they would be held responsible if the fire escaped and did injury to other lands. I expect to hear further from Mr. McDougall in regard to this fire.

I do not need to call the attention of the Board to the very unsatisfactory condition in which we are placed. With no appropriation to fight forest fires our hands are practically tied, for as conditions now stand there is little which this Board can do to assist in the work. I would suggest, however, that if it is possible to reach, through the Police Department, any of the persons whose carelessness or negligence is responsible for these recent fires, that such a request be made to the Sheriff of Hawaii by the Board.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF APRIL 3, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith the regular report of the Division of Forestry for the period from March 23rd to date.

During this time I personally have been principally occupied in completing for publication the Annual Report of the Division of Forestry for 1905, and in reading proof for the same, with the preparation of reports dealing with the proposed forest reserves in the Districts of Kau, Hawaii, Hana, Maui, and Waianae, Oahu, together with other matters in connection with forest reserve work.

In accordance with the instructions of the Board given me at the last meeting, I have prepared and sent out to each of the District Fire Wardens a circular letter calling their attention to the enforcement of the forest fire law, and to the fact that owing to the lack of a specific appropriation the Board could not be responsible for the payment of any bills incurred in fighting forest fires.

The routine work at the Nursery and in Nuuanu Valley has gone on as usual. This being the seed season for a good many trees a considerable quantity of seed is now being collected.

Important accessions to the Board Library received during this period by the Library are: Bulletin No. 3 of the Massachusetts State Forester's Office, on "Laws Relative to the Taxation of

Forest Lands"; Bulletin No. 36 of the United States Weather Bureau entitled, "First Report on the Relations between Climate and Crop," by Prof. Cleveland Abbe, and Mrs. Sinclair's Illustrated Plants of the Hawaiian Islands.

The Library room of the Board was used on March 22nd for the meeting of the Pawaa Improvement Club; on March 30th by the Honolulu Improvement Committee, or as it is now called, the Honolulu Improvement Advisory Board; and on March 29th and April 2nd by the McCully Improvement Club.

During the period a number of persons have visited the Board building to inspect the woods and fruits and to consult the Library.

I beg to inform you that I propose to leave Honolulu for a trip to the mainland, by the "Mongolia" on the 6th or 7th, and expect to return to Honolulu early in July.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

CAMPHOR IN INDIA AND CEYLON.

"Steps should be taken by the Forest Department to encourage the cultivation of the camphor tree. Since the Japanese have had Formosa the price has gone up at least 50 per cent. There is some attempt at cultivating it in Ceylon, and there must be many places in India and Burma where this valuable tree would thrive." This is a cultivation which will no doubt receive the early and serious consideration of the Ceylon Agricultural Board. There are many reasons why the cultivation of camphor should prove attractive to planters. Camphor at present has to be brought a great distance to Western markets, and the supply is very uncertain. Unscientific treatment of the trees has caused a gradual reduction of their numbers, and a deterioration in quality of the produce. It is at present a monopoly of Japan. The uses for camphor are increasing and as the demand increases, the price will rise. A fair start has already been made in Ceylon with the product.—*Indian Engineering.*

THE MELON-FLY

(*Dacus cucurbitae* Coquillett.)

BY D. L. VAN DINE,

Entomologist, United States Agricultural Experiment Station,
Honolulu.

Last season's crop of melons probably exceeded any previous crop since the advent of the pest of cucurbits known commonly as the "melon-fly." The reason for this is undoubtedly the persistence of the Japanese growers in protecting their melons from the flies at, or immediately after, the setting of the fruit. The low consideration at which these people place their time and effort (when working for themselves), enabled them to take the preventive measures and still receive, what is to them, a satisfying remuneration. In so far as a garden crop of melons, cucumbers, or related products are concerned, the writer believes that a householder can by the necessary precautions produce without prohibitive difficulty, sufficient for his own table. As an agricultural venture on a field basis, it is a question only to be answered by the attempt, taking into consideration the competition of the oriental growers.

This dipterous enemy of cucurbits belongs to the family *Trypetidae* and was described as new to science by Mr. D. W. Coquillett, of the Bureau of Entomology, United States Department of Agriculture, in the spring of 1899, from specimens bred in Honolulu by Mr. Geo. Compere, from larvae living in green cucumbers.

The food-plants are, locally, all the members of the plant family Cucurbitaceae (melons, cucumbers, squashes, pumpkins, etc., including a wild cucurbit, *Sycos* sp.); pods of string beans; tomatoes; and the fly has been reported as infesting ripe fallen mangoes and the fruit of the papaya.

The life-history, covering a period of about three weeks, is as follows: The female by means of her strong ovipositor, pierces the epidermis of the melon, or other fruit, and prepares just beneath in the tissue, an egg-chamber into which through the one incision are deposited from fifteen to twenty eggs. One fly is probably responsible for at least several such clusters.

Observations on the attack of this pest on watermelons indicate that the very young melons are chosen for oviposition since the rind or skin is tender and capable of penetration. Newly laid eggs have been found in melons varying in size from the time of setting of the fruit to three inches in length. The writer has visited infested fields where it has been practically impossible to find a melon within that size, not egg-infested, unless protected in such a manner that the fly could not reach the surface. Larger melons are found newly infested, but the point of incision is, in this case, near the more tender stem end. This is speaking only of watermelons, and undoubtedly mushmelons and cucumbers are capable of becoming infested much later in their growth. In a field where an epidemic of the fly exists the large melons contain the larvae in all stages of development, the melons likewise showing all stages of decay. Since the enemy is an internal feeder, a correct estimate of the damage cannot be gained by a passing observation. Many melons, perfect in shape, are found completely rotted upon being opened, with the exception of the rind. Even in cases where the attack is resisted, the result is a deformed product unfit for the market.

The vines, as well as the fruit, are infested. This is especially true if the growth is succulent. The vines are usually infested in the larger portions near the crown. During wet weather the decay of the fruit and vines progresses more rapidly. In dry weather, the vines, as a rule, survive the attack and the wounded portion heals over. After hatching from the egg, the larvae burrow on into the tissue of the melon, feeding entirely on the interior. When removed from the melon, the larvae have a peculiar mode of locomotion, or possibly protection,—they double themselves together and then, suddenly straightening themselves out, are thrown quite a distance into the air and a distance of several feet from the place they occupied. When fully developed the larvae leave the infested fruit or vines and enter the soil directly beneath where, at a distance of an inch or so from the surface, they pupate.

The remedies have thus far been preventive. The time of planting has no special significance since the fly is in evidence throughout the year and the varied list of food-plants insures a continuous chance for breeding, even though one or more of the crops it infests is discontinued for a season. The short life-cycle provides for several generations during the growth of one

crop. No parasitic enemy or other natural check has been observed.

The common preventive measure among the Japanese growers is to cover the young melons as soon as they set with a piece of gunny-sack, paper or some straw. When the melons have outgrown the protection of this covering they are usually beyond the danger of an attack by the fly. It requires constant attention to cover the newly set melons before they are visited by the over-industrious fly. Protection could be secured by hand-pollinating the flowers and covering them before the fruit is formed. There is a difference in the resistance of the different varieties of melons. The harder skinned varieties are less subject to an attack and it is well to select a hard skinned melon for planting in this country, even at a sacrifice of quality. Frequent cultivation around the plants close up to and among the vines will destroy many of the flies by covering the pupae in the soil to a depth which will not permit them to gain the surface on reaching the adult stage.

All infested melons and vines should be collected regularly throughout the growth of the crop and either burned or buried. Burning is the most effective, but if the acreage is large, holes can be dug at convenient distances throughout the field and a man be directed to go through the field at intervals of not less than five or six days, collect all infested melons and vines, throw them into the nearest hole and cover to a depth of several inches. Abundant irrigation should not be practiced since a succulent growth favors infection, especially to the vines.

After harvesting a crop the partly decayed melons and vines should not be left in the field to act as a breeding place for countless numbers of this pest, as is the custom. The writer has observed abandoned fields swarming with the melon-fly which, deprived of their food in these places, seek the products they infest in the surrounding district.

PIG KEEPING FOR BACON.

Why any occupier of the land should neglect to keep pigs is hard to understand. Food is usually cheap. The pig is also capable of getting its own living for comparatively nothing, and the remainder is reasonably found in potatoes, roots and damaged corn. I think generally too much attention is given to the sow when farrowing, as she is much better left alone. Attention then only excites the mother, causing her to lie on and smother her young. They should have a clean sty, with a moderate supply of short straw or cavins, and be kept with a limited quantity of food and plenty of water before and after for a few days. The losses will then be much smaller than if too much and frequent attention is given. It is surprising how soon the little ones, if given the opportunity, look after themselves in picking a few dry peas and drinking milk or milk and water. This mode of feeding should be adopted, and the owner will then find them make regular improvement, which does not slacken when the weaning season comes on, and a pig regularly and gradually fed commends itself to the feeder and consumer. When the pigs are weaned the mother can be kept sufficiently well for a few pence a day. When bacon is dear is a favorable time to prove the financial result between having a breeding sow and the feeding of several cattle. I am inclined to believe in the pig winning the race. A good and suitable mixture of barley, oats, and peas, ground and used with boiled potatoes or swedes, is much better and cheaper than feeding all meal. If a little milk is at hand, so much the better. Pigs change so often in value that I incline to the regular keeping of a few. They are the best scavengers, and great loss must accrue where there is damaged corn if the pig is absent. Of course, a man with cash in his pocket should generally purchase what he wants, but bought pigs seldom do like those bred on the place, and that have been reared and fed with judgment.—*Journal Agriculture W. A.*

DATE CULTIVATION IN SOUTHERN INDIA.

The Madras Government has discontinued the experiments it has lately conducted in the cultivation of the date. It is reported that the climate of Southern India is too tropical for the growth of this excellent fruit.

ENEMIES OF RICE IN JAPAN.

In an excellent article by P. Chumaturi Nicholas, which appeared in the *Tropical Agriculturist* last year, on "Rice Culture," the following brief excerpts are taken from the portion relating to the enemies of the industry:

Rice Birds. The first invaders are the rice birds (paddy finches and swallows) which husk and devour the seeds sown under "dry-sowing" in expectation of rain, before they spring up. The loss from the above attacks is made good by transplanting. The expedients tried to drive away the birds are primitive, viz., making a noise with dried olas, tins, etc., or shouting. Carrying a gun in one's hand is "considered in Jaffna as almost immoral."

Tortoises and Crabs cause damage by cutting and nipping the young plants. Crabs also may cause great damage by boring holes in the ridges if the cultivator is not vigilant.

Deer and Sambur browse upon the young plants, but are easily frightened away.

Grasshoppers cause much damage.

Caterpillars and Worms are very destructive at times. Of them *Spodoptera mauritia* is the worst pest. Worms and insects in some places are collected daily and burnt.

Paddy Flies (*Leptocorisa acuta* and *Hispa oenescens*) attack the fields by myriads and sap the juice at flowering time. A strong wind is the surest extricator of this pest.

Rats and Mice cut and steal the ears. Numbers are killed in their holes during harvesting.

Pigs evade the most careful watch and eat and trample the rice ruthlessly, causing more damage by the latter than the former. The wild pig is daring and wily and dangerous to the watcher.

Elephants are occasional visitors.

Stray Cattle and Buffaloes also occasionally break through fences even when constructed with barbed wire.

Cooly cultivators steal the seed paddy and by other nefarious practices cause loss. On the other hand miserly land owners inflict great hardship on their coolies by withdrawing food and exacting heavy interest.

The process of harvesting is also said to be very wasteful. The corn is stacked for months before being threshed and thus giving an opportunity for attack by insects and animals.

From the above enumerated list of devastators it would seem that rice growing in Hawaii is entirely immune from many of the attacks which threaten the industry in Ceylon.

TREE PLANTING.

In planting trees, too great stress cannot be laid upon seeing that the holes in which they are to be set are thoroughly prepared and fertilized. The plant should be set so that when the soil has settled, its surface will be three or four inches below that of the surrounding ground. If this is done the amount of water and attention required will not be nearly so much as if set in any other position. Not only is careless planting responsible for slow and stunted growth, but the general low vitality of the plant which results, is a direct invitation to insect attack, which will not long go unheeded. Trees and shrubs of vigorous growth are generally able to resist blight and other pests, and the best way to insure this is to exercise care at the time of planting.

MOSQUITOES AND CERTAIN PLANTS.

The recent investigations undertaken to establish the relationship of certain diseases to mosquitoes is rendered more interesting from the fact that to certain plants are attributed the quality of being inimical to the presence of these obnoxious insects. Among the plants attributed with this desirable quality are to be noticed *Ricinis communis*, the "castor oil" plant, and *Helianthus annuus*, the familiar "sunflower." Both of these plants are, apart from this reputed virtue, of such economic importance that they should be planted extensively in all low-lying and marshy neighborhoods, or upon those in which mosquitoes are common. The origin of the belief in the efficiency of the presence of sunflower to prevent malaria and fevers, if its unfavorable influence upon mosquitoes be true, is thus readily understood.

GUAVA FRUIT PULP.

Although the remarkable fecundity and capacity for reproduction of the Guava has earned for this plant an unenviable reputation almost equal to that bestowed upon the less useful Lantana, for taking possession of pasture land, yet there is very little doubt that if properly attended to, a very profitable return might be derived from the fruit. In many of the outlying districts of the islands, upon land which has either been abandoned to this plant and those of similar capacity for encroachment, or upon tracts which have heretofore been uncultivated on account of their sterility, enormous quantities of wholesome fruits are allowed to go to waste. This might all be used to profitable advantage if a system of fruit-pulping were introduced similar to that which is employed in many of the agricultural districts of France. The general scope of the method suggested is for the local growers or pickers to preserve the guava pulp in large containers, by an inexpensive and simple plan, and in this form to send it to a central jelly factory for future use.

The pulping is in France usually conducted on a large scale, but it should also be as easily and advantageously carried on with smaller quantities of fruit. The apparatus used consists merely of a copper pan and a metal tank. The fruit to be pulped should, after removal of the rind, be placed in the copper pan and heated to boiling, during which process it should be continually stirred with a wooden spoon. After boiling for a sufficient time it should then be emptied into tin containers which are soldered up. The tins are then removed to the metal tank in which they are immersed in boiling water for about twenty minutes. During this process, if any of the tins are not sufficiently soldered it will be detected, and in this case they must be removed. The quality of the product depends on the degree of cleanliness observed, in the care which is exercised to prevent burning during the process of boiling, in the kind of tins employed and in the manner of soldering. If thoroughly cleansed kerosene tins could be employed, the cost of producing the fruit, to which must be added the freight to a central factory, should not be more than from \$1.75 to \$2.15 per hundred pounds. The best quality of pulp is obtained in France by steam heating

instead of fire directly applied to the pans. This method is desirable in the more delicate kinds of fruit, such as the apricot and peach, but it should not be necessary in the guava if sufficient care is taken. As a rule a small quantity of water, varying with the kind of fruit used and which may be easily determined, is added to the pulp to assist in preventing burning. There seems in this proposed industry to be a splendid field for a man of small capital to establish a central jelly factory in Honolulu and to supply it with fruit pulp from a few pulping plants situated in favorable districts.

PLANTING SEED COCOANUTS.

The following notes on the preparation of seed cocoanuts for planting from the Report of the Philippine Bureau of Agriculture, are worth noting:

"In preparing nuts for planting the best results have been obtained in the following manner. The nuts are selected from trees known to be good bearers, bearing not less than 150 nuts per year, these uniform in size, brown in husk, rich in copra, and fully ripe. Fully 98 per cent. thus selected will germinate successfully. After cutting they should be placed immediately in the nursery provided (of course, in the shade) on the ground—not hung on poles as the native is said to do. Prior to placing in seed beds, a bit of the husk should be chipped off on one side; it should then be laid, cut side up, and left to germinate. Nine months usually elapses before they are ready for planting. The nut when placed on end, as is sometimes done, sends out a spindling plumule easily broken at the point of protuberance and, at best, never gains the vigor of those germinated according to the method given. Two thousand nine hundred and thirty-one trees have been planted this year, most of them on ground that has been plowed and pulverized and put in the same condition as for a corn crop. The result has been a marvellous growth, the trees being more than twice as large as those left to themselves."

ANTS AND FRUIT TREES.

The failure of fruit upon fig, orange and other trees is often apparently due to the presence of ants, which introduce and propagate various pests to the destruction of all new growth. In cases of this kind after thoroughly cleansing the tree either by means of spraying or, if the tree permit it and the attack is not too far advanced, by judicious removal of the affected branches, the pest may be controlled if the ants can be prevented from further invasion. Constant experiment has been made during the past two or three years to exclude ants from certain affected fig trees, but until recently little success was attained in consequence of the untiring persistence of these persevering insects. Many methods were employed, some of which were found destructive to the trees, and others were rendered more or less useless on account of the time and constant attention required. The most satisfactory and probably the simplest device has been found to be a strip of fur or goat skin tied closely around the trunk in such a way that the hair points towards the ground. Various viscid and corrosive preparations have been tried, but these for various reasons have not been satisfactory. Very good results were also obtained by rubbing a band of chalk (which needs constant application), eight or ten inches wide around the tree, across which the ants have difficulty in passing. By the use of either of the methods suggested, there is no reason why even growers of large numbers of fruit trees should not be able to protect them from the pests which are introduced and spread by ants.

CURRENT PUBLICATIONS.

The Agricultural Gazette of New South Wales, January, 1906.

The Application of Science and Scientific Method to Agriculture, by F. B. Guthrie. February—Fencing by G. L. Sutton; The Cultivation of the Castor Oil Plant by Q. Ercole.

March—Tomatoes and their Diseases by Walter L. Froggatt.

The Journal of the Department of Agriculture of Victoria, February, 1906. Surveying on the Farm; Levelling by A. S. Ken-

yon. *March, 1906*—Surveying on the Farm; Mensuration by A. S. Kenyon; Strawberry Culture by James Lang.
The Queensland Agricultural Journal, March, 1906. Silage and Silos. Poultry: Feeding and Fattening Chickens.
Bulletin of the Department of Agriculture, Jamaica, February, 1906. Grape Fruit and Shaddocks by Sir Daniel Morris.
The Florida Agriculturist, March 28, 1906. Making the Most of the Vegetable Garden. *April 4.* Citrus Fruit Pointers.
Queensland Agricultural Journal, April, 1906. Chemistry Lessons on the Chemistry of the Farm, Dairy and Household, by J. C. Brännich. The Black Wattle in Hawaii and Natal.
The Tropical Agriculturist, Ceylon, February, 1906. The Avocado: A Salad Fruit from the Tropics.

THE BANYAN TREE.

The Banyan tree (*Ficus Benghalensis*) is an East Indian tree of the order of Urticaceæ, and while extensively planted, occurs in a wild state only in the lower Himalayas and the Deccan Hills. It has been raised in other lands, fine specimens being reported in Honolulu and elsewhere.

It is noted for its roots, which descend from the branches and become accessory trunks, permitting the tree to extend over a wide area. As the tree ages the original trunk dies and decays, leaving the younger trunk to support the life of the tree.

A banyan tree on the Nerbudda River is reported to have had more than 3000 small trunks. Among these trunks and leafy aisles it is said 7000 people could stand. This tree is now much reduced in size by floods. The tree is not high, the maximum being usually about 70 feet.

The leaves are heart shaped, 5 to 6 inches long; the inconspicuous axillary flowers are succeeded by cherry-like scarlet fruits growing in pairs from the axils of the leaves, which are eaten by the monkeys. The seeds seldom germinate on the ground, but usually among the leaf bases of palms, being deposited by birds; the roots descending the palm trunks, embrace and finally kill them.

Its light porous wood, its juice and its fruit have no economic

uses. The bark is regarded by Hindu physicians as a powerful tonic. The white gelatinous juice is used to relieve toothache and reduce inflammation of the soles of the feet, also to make bird lime. Gum lac is obtained from the tree.

The Hindus regard the tree as sacred, and it is described by Southey in his poem, "The Curse of Kehama."

Its close relative, the *Ficus Indica*, is sometimes erroneously called the banyan tree.—*Forest Leaves*.

PRICKLY PEAR.

Experiments have been conducted by the Queensland Government to investigate the most satisfactory method of eradicating the prickly pear upon land which had been invaded by the persistent growth of this plant. The ground selected was very steep and covered with an almost impenetrable mass of the cactus. The men employed were protected against the sharp needles of the plant with leather leggins, and were armed with specially constructed mattocks with which they chopped the plant to the ground. The leaves and stem were cut into small pieces and sprayed with a solution of sodium arsenic. Under this treatment three or four days after the application of the spray the plants became brown, in which withered condition they soon rotted and disintegrated. The spray appears to have had no deleterious effect on other vegetation, although the roots of the cactus were so thoroughly destroyed that some months after the experiment no new growth of the plant was observed. The spray used was composed of four pounds of white arsenic and three pounds of washing soda, boiled for half an hour in one gallon of water. Of this concentrated solution about six ounces were used to a gallon of water for spraying.

WATER-CRESS.

Water-cress may be successfully grown on ordinary garden soil without the aid of running water. When water is laid on from pipes, water-cress will thrive as well as in a running stream. To cultivate on ordinary soil, prepare a bed of good mould about 6 inches deep. Smooth and water it in the evening, and next day reduce the soil to a fine tilth. Mix the

seed with fine sand, and sow as evenly as possible, and cover very lightly with a thin layer of mould. Press the seed down, water, and cover with matting. When the seed has sprouted, replace the matting with a shade of branches, and keep the soil quite moist. The plants soon grow; by and by they flower, when a new covering of mould is given them, leaving the plants about 1 inch above ground. Then water freely. Ten days later shoots will appear springing from the roots, which, when 2 or 3 inches high, are removed, and pricked out 3 or 4 inches apart in a new bed. A fortnight later the cress will be 6 inches high, when cropping may begin and continue right up to the first frosts, cutting every fortnight. Care must be taken to give copious waterings every evening. The seed should be sown in spring.—*Queensland Agricultural Journal*.

THE FARMERS' INSTITUTE.

NOTICE OF MEETING.

Honolulu, Hawaii, May 1, 1906.

The next regular meeting of the Farmers' Institute of Hawaii will be held at the Library of the Territorial Board of Agriculture and Forestry, on King street, Saturday, May 12, at 7:30 p. m.

The important subject of co-operative marketing of Hawaiian agricultural products is to be thoroughly discussed at this meeting, and a good attendance is hoped for.

The following program has been arranged:

Report of the Committee on Co-operative Marketing.

"The Necessity of Growing More Fruits in Hawaii," Mr. William Weinrich, Jr.

"Some Advantages of Co-operative Marketing," Mr. John Emmeluth.

Discussion.

All persons interested in the furtherance of Hawaii's agricultural interests are cordially invited.

(Signed)

F. G. KRAUSS,

Secretary.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

MAY, 1906

No. 5

The excellent paper contained in this number by Dr. William T. Brigham, on the culture of the "alligator" pear, will be read with great interest. It embodies the substance of an address delivered by Dr. Brigham at the meeting of the Farmers' Institute at Kamehameha Schools last year, and completes the knowledge at present available to us on the culture of this esteemed fruit. We hope that the suggestion of the writer that the native name "palta" be substituted for the absurd "alligator pear" will be adopted. It is said that the tree was introduced by the Incas to the valley of Cuzco from the province of Paita, but whether the tree or the province has the priority of name is uncertain. At all events the Inca word should be given precedence to any of the extraordinary appellations by which this excellent fruit is designated. The Aztec name, as given by Hernandez, is "ahuacaquahuitl," which it is said means "resembling the oak." The Andulasian "aguacate" and the Castilian form "avocado" are without doubt Spanish attempts to pronounce the more unwieldy Aztec name, and the inappropriate and grotesque term "alligator" is said to be a corruption of one or other of these. The French name of the fruit, "avocat," is a modification of the Spanish "avocado" or "abogado," from which association the occasionally heard "Lawyer pear," has been evolved. The term "pear" is readily accounted for, as is also such names as "midshipman's butter," which formerly were more frequently applied. The botanical name "Persea gratissima" is more happily given, but for ordinary usage none is so appropriate or of such historic association as the original word "Palta."

Much valuable information relating to the cultivation of the Palta will be found in our March number of last year.

1906

We are glad to present to our readers in this number an account by Mr. F. G. Krauss, with illustrations, of the first Silo erected in these Islands. The interest in this method of conserving fodder is rapidly gaining in favor in progressive countries, and it is a matter of surprise that it has been of so tardy introduction here. In order to produce milk to the best profitable advantage the silo is an indispensable adjunct to the modern dairyman. Its adaptability to so many different fodder crops renders it an easy matter to preserve the surplus amount for periods of shortage.

The most important problem facing the growers of fruit in Hawaii is that brought before the meeting of the Farmers' Institute on May 12th last by Mr. John Emmeluth. The necessity of concerted action by the pineapple and banana growers in order to market their products to the best advantage is unquestioned. Without some such equitable agreement the coast market is at any time liable to be glutted with Hawaiian fruit shipped from our various plantations, which are thereby brought into direct competition, one with another, to the general disadvantage of all. By means of a properly organized association controlling the Hawaiian output, and distributing it equally among the coast cities, our whole island production of fruit could be sold to satisfactory advantage. Such an organization is by no means a combination of growers working for their own benefit solely, but has its direct utility to the public at large by keeping it regularly supplied throughout the year with sound fruit, instead of leaving it to the irregular and precarious provision of chance. It is of the utmost importance that before the present season's output of pineapples is ready for shipment that the projected organization will have the subject well in hand, as the success of many small growers is dependent upon the efficient action of such a scheme as that advocated in Mr. Emmeluth's paper.

The Forester was fortunate enough to be able to obtain last year a series of monthly articles by Mr. F. G. Krauss, upon the vegetable garden. The practical experience contained in these has been of invaluable assistance to small growers, and we are continually being reminded of their appreciation. It is hoped that before long the Forester will be able to secure the interest and coöperation of an agriculturist sufficiently versed in our

local conditions, to write a series of papers upon the laying out and maintenance of ornamental flower gardens. In spite of our splendid climate, flowers which succeed admirably in the country of their production as a rule require especial care and treatment in Hawaii. Such knowledge can only be acquired by long observation and practical experience. There are, however, a number of hardy plants which readily adapt themselves to our conditions and flower profusely here with a minimum of cultivation.

The love of flowers is too often confined to the placid content of admiring them in another's garden, but we would see Honolulu a veritable city of flowers, and one in which every house lot has its properly cared-for flowering plants. Foliage plants are a valuable ornament to any garden, but one should not be content to abandon one's whole yard solely to these. A properly directed taste for flowers should be an essential feature in the education of the young, and is one of the best means to beautify the home and render it bright and attractive.

However small a house lot may be, it should be arranged in some systematic plan in conformity with its general shape and contour and in harmony with the house which it is to ornament. Probably nothing adds so much to the attractiveness of a small home as a well kept lawn surrounded with neatly trimmed borders. Beyond these, as space permits, there should be first placed flower beds and then clumps of attractive crotons, dracenas and other foliage plants, set out in such a way that the larger are in the background. Care should be taken not to cumber valuable space with unsightly or unseen plants, but to have the few so arranged that all are ornamental and displayed to advantage. Shrubs should be pruned within bounds, but this should be judiciously done in such a way as not to appear mutilated or dwarfed.

Foliage pot plants are easily grown and should be made extensive use of. Of these begonias, caladiums, ferns, small palms and orchids are among the most useful. It must be remembered that with these, as with every other gardening operation, the degree of success attained will be commensurate with the care and attention bestowed. In preparing soil for potted plants, leaf mold, well rotted manure, road scrapings, decayed or chopped cocoanut fibre, fine sand, broken charcoal

and pot sherds, each have their proper use. After planting, a layer of moss, leaves or fibre placed upon the surface of the pot will serve to keep the drainage from becoming clogged and will prevent too rapid evaporation.

The approach of the fruit season calls attention to the mango, which is probably the most extensively grown fruit tree in Hawaii. It is extremely easy to propagate, grows quickly and fully repays with an abundant crop the space which is given up to it. It is unfortunate, however, that in spite of the fact that it responds readily to cultivation, its care is so neglected and that so many inferior kinds are tolerated. There is little excuse for this, as a choice tree takes up no more ground and produces a fruit of delicious flavor and creamy consistency, instead of the fibrous and turpentine varieties so prevalent in Honolulu. Many fine varieties of mango are to be found in and around the city, those cultivated at Mr. Damon's Moanalua estate being probably best known. Much successful work has been done by Messrs. Gerrit P. Wilder and Donald MacIntyre in budding and grafting mangoes, and we would advise all those who have trees with which they are not satisfied to consult one or other of these gentlemen as to how they may be improved by these means. The May number of the Forester for 1905 contains a full description by Mr. MacIntyre of the various processes of grafting, which could be successfully accomplished by anyone familiar with garden operations.

We are in receipt of a communication from Mr. William Dutcher, President of the National Association of Audubon Societies, in which he desires us to bring the attention of readers of the Forester to the work the association is engaged in. He also sends a number of interesting pamphlets written with the view of disseminating a proper knowledge of the utility of bird life. The association was founded in order to protect wild birds and animals from useless destruction, and from the information at our disposal we are able to give in this number an account of the inception of the movement which finally culminated in the organization referred to. The disappearance of our beautiful Hawaiian birds is a matter of great regret, and the absence of indigenous birds in many districts cannot but exercise a detrimental effect upon agriculture by allowing

many entomological pests to go immune from bird attack. A proper and enlightened knowledge of the economic importance to Agriculture of different species of birds is very desirable, and much useful and instructive information on this subject is contained in the Audubon Societies' publications, which we shall be glad to place at the disposal of any of our readers who may be interested in this matter.

THE BRICK-RED BOUGAINVILLEA.

The ordinary varieties of bougainvilleas may readily be propagated from cuttings. The handsome brick-red one unfortunately presents more difficulties, and cuttings from it rarely succeed. It is said to be capable of propagation by circumposition, a somewhat tedious operation.

PLANTING OF COCO-NUTS.

Although the cocc-palm is very productive when favorably planted, there are two kinds of soil on which it will not grow profitably. Upon thin soil overlying rocky foundations and upon compact clayey soil which retains water, no generous growth will be maintained. The best sites are to be found upon level lands exposed to the sea breeze where the soil is good, as in valleys which have been filled up with rich humus from the hills, and along river banks. Where the soil is rich the crops will be enormous. A loamy sand is also very favorable to good development.

In preparing the holes for planting coco-nuts they should be made about three feet deep, and filled in to half their depth with soil from the surrounding surface. A plant so started will gain perceptibly upon one set in too small a hole.

REMARKS ON THE *PALTA* OR *AVOCADO PEAR*.

By William T. Brigham.

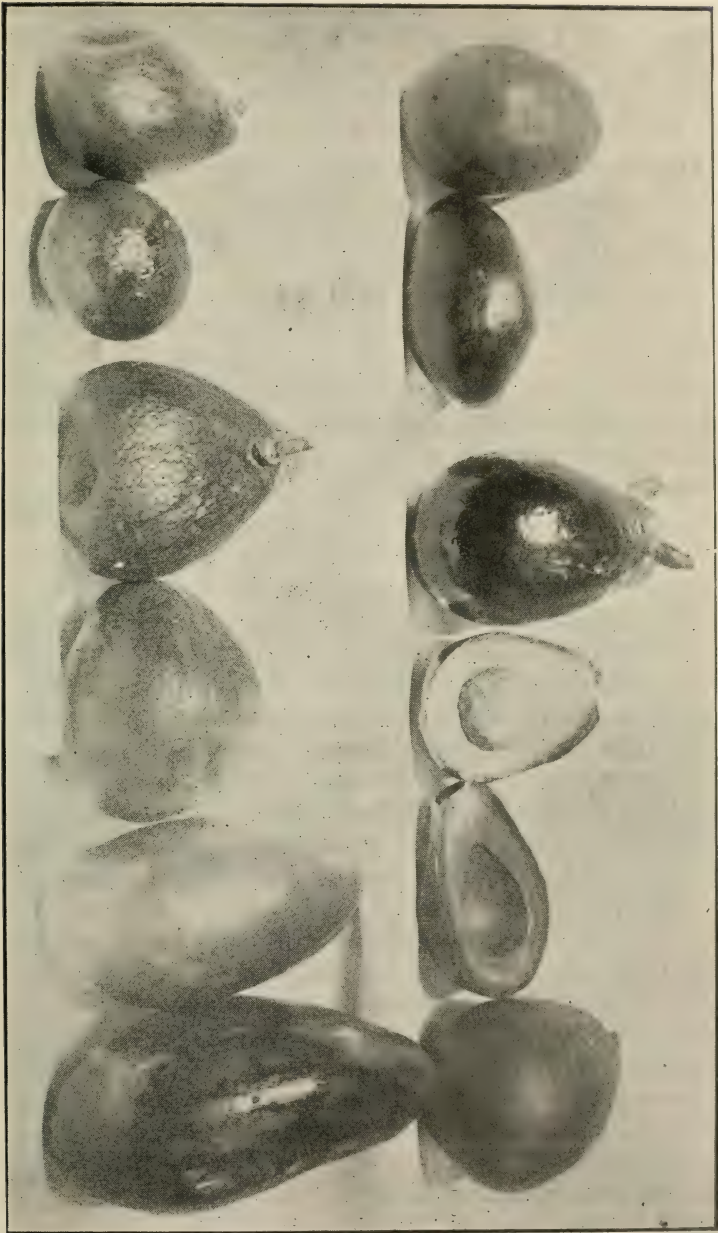
Forty-one years ago the best palta tree in Honolulu was in Judge Montgomery's garden, the place now occupied by the St. Louis College. It was of the purple variety and the judge kindly sent one of these rare fruits to Horace Mann and myself, who had recently come to these islands. We neither of us liked this fruit, at which the giver expressed his satisfaction, "as there were not enough to go around."

Near the head of Pauoa valley was a very neglected tree, which, in my botanizing rambles, I at first took for a part of the forest, but on examining the fruit found it a small green pear. It was the first tree of the kind I had seen, and I afterwards learned that it had been planted by the Spaniard Manini or Marini, who introduced so many good fruits. On Kauai at the Princeville estate belonging to R. C. Wyllie, Hawaii's greatest Minister of Foreign Affairs, I found a tree bearing a rough-skinned green fruit, which I learned to like although it was far inferior to those now cultivated in Honolulu. On Hawaii were the largest and oldest palta trees. Mr. Wyllie was consul for Peru or Chili, or perhaps both, and may have imported the fruit, but he was not the first one, for the paltas were here in 1825.

The wood of the *Persca gratissima* is of fine grain and rich color, and at one time was in great demand in England for furniture under the name of Barbados mahogany. Specimens in the Bishop Museum from one of the large trees of Hilo certainly show a pleasing cabinet wood.

My object this evening, however, is not to describe all the history and good qualities of this favorite fruit, which I wish we could call by its original Spanish-American name of Palta in place of the absurd avocado or lawyer pear, or the stupid corruption alligator pear. I intend only to give you briefly some of my experience in cultivating this fruit. We here are all too ready to merely plant the seed and do nothing more: we "push the button" and leave the rest to Providence. This institute is established, I believe, to help us to make some exertion ourselves, and by so doing better our products.

In 1888 I was supplied with very good paltas of the pur-



ple variety grown by a friend in Pauoa valley. As these were of one variety I selected the best fruits,—that is those that tasted best and had the best form without consideration of the bearing qualities of the parent tree. In 1890 I took six of the most vigorous plants resulting from these selected seeds to my present residence on Judd street and planted all but one in the ground on the lee side of the house, as this tree needs shelter from the winds, which are often strong in that part of Nuuanu valley.

The soil was not originally good, and the place was rocky, but by blasting out the most objectionable ledges and replacing them with earth removed from the site of the house, which was then enriched with both natural and chemical manures, a fair chance was given the young trees, which grew well. The fruiting results were curious. One on a more rocky bed produced a small green fruit much inferior to the parent, and as the tree was in the way I cut it down. Another tree in perhaps the richest part of the yard grew well, but the fruit of the first bearing was green, rough-skinned and watery; it is shown in the first two specimens on the left of the lower line in the illustration. It was disappointing, but careful cultivation wrought a great change the next year, the product being shown in the two middle specimens of the lower line, and the change was not merely one of size but the quality of the fruit was entirely changed from a watery, tasteless fruit to a pale yellow, rich, custard-like fruit not so oily as the average pear of the market. It is a good bearer, yearly, and the fruit sets well, but does not keep as well as the purple varieties, although the skin is thick and tough.

My best tree so far as growth and size and quality of fruit go, is one for which I had no very good place and so left it in the box in which it was transported from the nursery. In time the bottom of the box rotted, the roots penetrated deep into a rich bed around a fountain basin, and as the tree grew very luxuriantly, I left it to fruit and show its quality. The result was a long smooth, green fruit with a rich, dark orange, nutty-flavored meat and very small seed. The two fruits shown on the right of the lower line were from this tree and weighed 32 and 33 ounces. So far as the quality of the fruit is concerned, I could ask for nothing better, but while the tree blossoms early with the greatest profusion, very few fruits

come to maturity, and these are apt to decay at the stem end if not picked promptly.

Another tree much resembled the parent, and the fruit is shown in the left hand figure, upper line; it was purple. The best all-round tree of the lot bears annually a good crop of well-sized (16 to 18 oz.) purple fruit shown in the remaining specimens on the upper line of the figure. These, as will be seen from the sectional specimen, have sufficient meat and medium sized seed. Keeping qualities are good and they have been sent to Sydney, N. S. W., in good condition, and on the tree a succession of fruits has extended the season to six months (April to October).

Here then are marked variations from a single tree that would have given Mr. Luther Burbank great pleasure and a fine chance to develop better points. But Mr. Burbank's process is no secret, and the way is open to you gentlemen of this institute to modify the Palta to such forms and qualities as may better serve the needs of transportation and the palates of those to whom this delicious fruit is strange. I know of no fruit where the principle of variation is more marked, or which yields more readily to treatment. If it be thought worth the while, we have a good stock to experiment upon, for I have tasted the West Indian varieties and those of Guatemala, and to my taste the fruit grown on these islands is superior to these competitors. I have not eaten the fruit from the west coast of South America, probably its native soil, but I know fairly well the little cultivation it gets there, and I am convinced that without cultivation, the finest qualities of the Palta never appear.

SHIPMENT OF ALLIGATOR PEARS.

The alligator pear can be shipped in cold storage. Successful shipments have been made by the Hawaii Experiment Station, as far East as New York City. This salad or breakfast fruit is one commanding special prices for fruits of good size and quality. Selected shipments sell for from \$4 to \$6 per dozen, in San Francisco. The local demand is also large and local prices are quite satisfactory. The alligator pear is a tree susceptible of orchard cultivation, requiring less water than citrus fruits. It grows better at the lower than at the higher elevations, seldom producing a crop of fruit when grown above 2000 feet. It likes protection from winds.—*Jared Smith.*

THE SILO IN HAWAII.

The recently constructed silo at the Kamehameha Schools' farm and its storage with silage for the first time on the 16th inst., has occasioned much interest among the several agriculturists who are watching the experiment and recognize its value to Hawaiian agriculture if successful.

While the practical preservation of green fodder in silos* dates back to a hundred or more years ago, European husbandmen being the first to make this application of the ancient's practice of storing grains in pits, the ensiling system was not introduced into America until 1879 upon the appearance of a translation of A. Gaffart's noted French work on "ensilage."

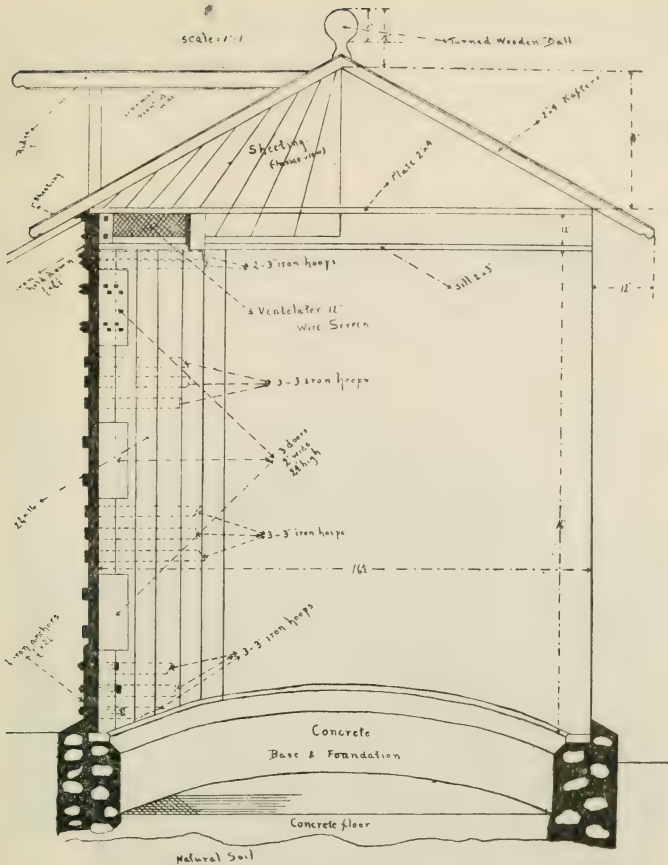
Since then the silo has made wonderful progress in the United States—numbering 91 in 1882, it is estimated that half a million are now in operation throughout the Union—where ensilage is almost universally recognized as one of the most economical and satisfactory food stuffs obtainable for dairy cattle.

The several recent successive dry years in Hawaii and the consequent shortage of green, succulent pasture and fodder for dairy cattle for the greater part of the year, led the writer to investigate the adaptability of the silo to Hawaiian conditions. While in California in the fall of 1904, a number of leading dairies where the modern silo formed an important feature were visited, five silos, varying from 100 to 250 tons capacity, in operation from one to four years, were carefully studied. Reports and observations were so favorable in this investigation, where climatic and other conditions were so nearly like our own, that the experiment of introducing the silo into Hawaii seemed well worth while.

A 65-ton silo was planned for use on the schools' farm last fall; the staves of a 20,000-gallon water tank being available, these were utilized for the body of our silo. By inverting each alternating stave, the tapering form of the tank was converted into a perfect cylinder 16 feet in diameter and 18 feet in height. This was set upon a concrete foundation which also formed

**Silo*—an air-tight structure used for the preservation of green fodder in a succulent condition.

Silage—the feed stored in a silo (formerly called ensilage).

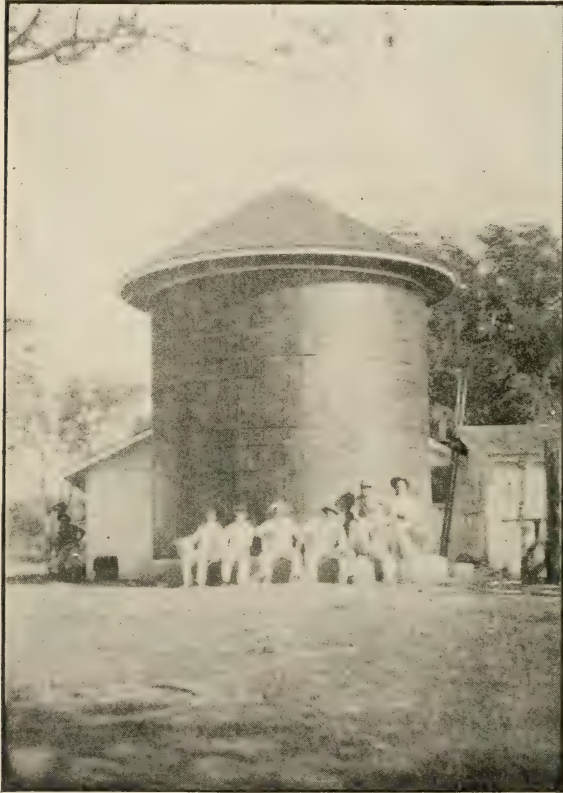


the walls of a thirty-inch pit, giving the silo a total depth of about 20 feet.

The top of the silo is capped with a shingled conical-shaped roof; immediately under the roof, an open space, a foot in width, is provided for ventilation. Three doors, one above the other, and facing the barn, provide an easy means for removal of the silage, but the filling is done through a dormer window in the roof. The plan and pictures herewith will give a good idea of the construction and general appearance of the Kamehameha silo.

The more important requisites of a silo are that its walls should be as nearly air-tight as possible, else the loss from ex-

cessive decay of the silage will be very great. The structure must be rigid, and the inner surface smooth and uniform, so as to facilitate the rapid and complete settling of the silage, and it should be built of durable material. Then the fodder should be of suitable kind and at the proper stage of maturity.



KAMEHAMEHA SCHOOLS' SILO

Hawaii's First Silo; Completed March 15, 1906. Filled April 15, 1906.

Indian corn, all things considered, has thus far proven the most satisfactory silage crop. It should be harvested when the seed begins to glaze, and the whole plant utilized.

In practice it is difficult to make the silo absolutely air-tight, so that even in the best built structures there is some unavoidable loss; this is variously estimated at from 5 to 12 per cent.

The surface layer, which rots to a depth of from 3 to 6 inches, seals the mass below, no further covering being necessary.

After feeding begins, which may be at any time after active fermentation has ceased, a sufficient quantity, say from four to six inches, must be fed off daily to keep ahead of mould and decay which results from each fresh exposure to the atmosphere. The number of cattle fed should govern the diameter of the silo—if 20 head of cattle are to be fed 30 pounds silage daily, a 16-foot circular silo would permit of sufficient removal to keep in advance of decay. Silage weighs from 35 to 60 pounds per cubic foot. Other things being equal, the deep,



FODDER CORN FOR SILAGE KAMEHAMEHA FARM APR. 15, '06

Part of four acres, Indian Corn, Sorghum and Cow-peas used in filling Kamehameha School's Silo.

narrow silo preserves the fodder best; this is owing to the fodder mass becoming more compacted, thus excluding more air.

Silos are now constructed of wood, brick, stone and concrete, and of from 50 to 350 tons capacity. Wood is, of course, the cheapest in first cost and is the material most used. There are several methods of construction; the stave silo, on the plans of which the Kamehameha silo is built, is the simplest and cheapest of the round form, but has some short-comings, chief of which is its tendency to dry out and shrink when empty, making it difficult to restore it to an air-tight con-

dition upon refilling. Complete stave silos are now offered for sale in a "knocked-down" form, the staves carefully matched and tongued and grooved and are said to give entire satisfaction.

A better construction is what is called the "Wisconsin" or "King" type of silo, which consists of 2"x4" studding set on end, a foot apart around the circular concrete foundation. To these is attached the lining consisting of two layers of half-inch sheeting put on horizontally, with a well lapped layer of water-proof paper between. No outside weather-boarding is necessary, though it adds greatly to the strength and appearance of the silo.

Square or rectangular form are no longer advocated; the difficulty of settling the silage evenly, especially in the corners, and preventing the walls from bulging, are the main reasons for their disfavor.

Nearly all the solid stemmed fodder crops seem adapted for silage, but the grasses having hollow stems, which offer recesses for air, do not ensilage well.

Indian corn is doubtless the best of all silage crops, as it yields heavily of a superior fooder, which keeps perfectly under favorable conditions. Alfalfa, sorghum and cow-peas are also excellent crops for ensilaging.

For experimental purposes at Kamehameha this year, a dent variety of larger yellow field corn, sorghum and cow-peas were grown as silage crops and were placed in the silo in layers after being cut into half-inch lengths with an ordinary fodder cutter.

The average yields on good soils, but with a lack of water for irrigation, were 23 tons for the corn, 14 tons for the sorghum and 9 tons per acre for the cow-peas. In favorable seasons we have had much larger yields.

It was intended, also, to fill part of the silo with sugar-cane tops, it being suggested that this otherwise largely wasted material might be utilized for silage to good advantage, though it is as yet a question whether or not the relatively large sugar content will develop an excess of acid during fermentation. It is an experiment well worth trying. Doubtless,

other tropical and semi-tropical fodders that flourish during seasons of rainfall may be profitably ensilaged and thus a succulent feed be made available during seasons of drought as at present.

Summary.

1. The silo has come to stay in all dairy sections of the United States where thus far tried.

2. Southern and California dairymen, whose conditions are not unlike our own, are loud in its praise.

3. Because, silage provides nutritious, succulent food for dairy stock at a time of the year when such vegetation is scarce.

4. It is not advisable to feed silage alone; for mature cattle, 25 to 35 pounds per day is a reasonable allowance; a small amount of hay and the usual amount of grain should be added.

5. Of the green fodders suited to silage, India corn, alfalfa, sorghum and cow-peas are the best and cheapest thus far known. All thrive in parts of Hawaii.

6. The best time to harvest any green crop for silage is at or near maturity, before the leaves turn yellow; at this stage they contain the greatest amount of nutriment, and fermentation is least active.

7. On an average, 3 tons of silage are equal in feeding value to 1 ton of well cured hay.

8. The silo provides a more economical and compact method of storing fodder than the hay mow.

9. The silo is especially adapted to intensive farming, where land is high in value and storage space is limited.

10. A carelessly constructed silo is an extravagance and cannot give satisfaction.

The results of this first experiment with the silo in Hawaii is awaited with deep interest. A more full account will be published after the feeding of the silage is begun.

F. G. KRAUSS,

Agriculturist Kamehameha Schools.

*"AGRICULTURAL POSSIBILITIES OF THE TERRITORY
OF HAWAII."*

A publication under the above title, issued by the Hawaii Promotion Committee and written by Mr. Jared G. Smith, special agent in charge of the U. S. Experiment Station in this Territory, deserves more than passing attention. The pamphlet commences with a brief and interesting description of the climate of the islands, which we are glad to see is described as "sub-tropical." The statement is too often expressed by those who have the best interests of Hawaii at heart, that the islands are "tropical." Although our islands actually lie within the tropic zone, those who have knowledge of the intense and enervating heat of a truly tropical country, are reluctant to apply a term to our equable climate which can only create an impression upon those who hear it, of an existence where every effort is a burden in consequence of the excessive temperature. The insular position of these islands, which are lanned by invigorating trade winds for most of the year, in spite of our geographic condition, renders our climate not only well nigh uniform throughout the year, but also sufficiently moderate in our hottest months to allow of all the physical exercise and exposure to the sun, as can be enjoyed in a temperate country.

After a brief account of the different soils of the islands the pamphlet gives a description of the various agricultural industries established here. It is not difficult to see that not only is Mr. Smith an enthusiastic lover of Hawaii and a thorough believer in its future agricultural development, but is, in addition, perfectly conversant with every phase of the subject on which he is writing.

As the publication is primarily intended for mainland agriculturists, who may desire to obtain information of our local industries, little space is occupied with our principal crop, sugar, as its cultivation is generally in the hands of companies possessing large capital.

The pineapple, sisal, banana and coffee industries are treated of at greater length, and then follows a more descriptive article on the newer and at present little known tobacco industry. The Hawaiian Experiment Station has now been conducting

investigations for three years to determine whether good tobacco can be grown in the islands. Most favorable results have been obtained. The experiments were conducted in Hamakua, Hawaii, where the chief types of commercial tobacco are being grown. The final results indicate that wrapper tobaccos of fine texture, and body and filler leaf of mild flavor and good burning qualities, are a commercial possibility. The flavor of the Hawaiian grown tobacco is said to be distinct and to lie between that of the Manila and Cuban products. It is believed that our island tobacco can be sold on its peculiar and intrinsic merits. There are at least 100,000 acres of land in Hawaii where the physical character of the soil is right for growing this crop. It is estimated by Mr. Smith that a grower may produce tobacco on his own land and with the labor of his own family at a cost of from 2 to 2½ cents per pound of green leaf, equal to from 10 to 12½ cents per pound of barn-cured tobacco.

Hawaiian tobacco grows wild throughout the islands without cultivation, and has reverted to its original type. The old Hawaiians recognize certain limited districts as producing superior tobacco, the best grades of which are sold at about 50 cents per pound.

Vanilla, another new and promising industry, is then dealt with. The bean from which this esteemed flavoring is obtained, is the cured fruit of a climbing orchid, which is not produced unless the flowers are hand pollinated. This is a delicate operation, not difficult to learn. The fruit pods are gathered before ripe and are cured by sweating while green in the direct sunlight between folds of woolen blankets. The yield per acre in Hawaii has been estimated at about 13,000 pods, equal to 120 pounds of cured beans. The industry is very profitable to one having sufficient means who will give it personal supervision. Five acres of vanilla, in bearing, should yield a crop valued at from \$2000 to \$2500, but there will first be an unproductive period of about three years.

The silk industry has been another source of valuable experiment, conducted by the Experiment Station, which has lately produced a crop pronounced by experts as "well worthy of being graded as first class." Eggs for experimental purpose and also mulberry cuttings will be furnished free of charge by the Station, so far as possible, together with full

information relative to the care of silk worms. The industry is not suited for women and children as has often been stated, but it requires a man's full time during the whole period from the hatching of the eggs until the transformation to the cocoon takes place. The industry is suggested to those whose established occupation is in progress only a portion of the year.

Dairying, poultry, vegetables, fruits, bees, stock raising and rubber all come in for generous treatment.

The pamphlet in question is well written and presents a mass of valuable material in a thoroughly interesting way. It should be widely read by residents of this Territory and be sent to all who are interested in the development of Hawaii.

NON-FRUITING OF MELON VINES.

Many practical gardeners hold the opinion that some plants, like the cabbage, and also pumpkins and melons, head and fruit better when old seeds (two to three years of age) are sown. This is an exception to the general rule, which shows that fresh seeds possess a higher germinating power and produce more vigorous plants. A French experimenter, Caziola, found that melon and squashes raised from fresh seeds bore a larger proportion of male (*staminate*) than female (*pistillate*) flowers, while older seeds bore more female than male flowers. This may be the reason of the scarcity of female flowers in certain cases. It is well known, however, that male flowers of plants of the melon and squash tribe usually appear five to six days before the female flowers, and also that they are much more numerous than female flowers. In this way while plenty of pollen is provided, self fertilisation of the female flowers by the male flowers of the same plant is checked, and cross fertilisation, aided by the agency of insects and wind, is made easier. As a general rule, a practical result of cross fertilisations, is that more vigorous and hardier subjects issue. Some gardeners affirm that when growing pumpkins or melons it is advisable to mix a small proportion of new seed with the older seed, to provide vigorous and leafy vines with an abundance of pollen.—*Journal of Agriculture, W. A.*

NATIONAL ASSOCIATION OF AUDUBON SOCIETIES.

The wholesale destruction of wild birds during the last few decades of the last century had assumed such proportions that it was foreseen that if this were allowed to continue unchecked, it would be but a short time before the majority of the most beautiful species of American birds would be extinct. A writer, in "Forest and Stream," stated in 1884: "The destruction of American wild birds for millinery purposes has assumed stupendous proportions. The unholy work gives employment to a vast army of men and women, and this army wages its campaign of destruction with a dreadful perfection of system." The editorial refers to details of the work published in other columns of the paper, which furnish evidence of the systematic character of the business. It was during this year that the work of exterminating the Terns commenced and the destruction was carried on from Florida to Massachusetts, and hundreds of thousands of these beautiful and graceful creatures were sacrificed on the altar of fashion. Today the small remnant of the once countless throngs of Terns, or Sea Swallows, are being carefully guarded by wardens in the employ of the Audubon Society, who are paid from the Thayer Fund. They now live in peace and happiness, are permitted to breed in security, and, thanks to a growing sentiment of kindness to all wild life, are rapidly increasing in numbers.

In the minutes of the second annual meeting of the American Ornithologists' Union, held at the American Museum of Natural History in New York, September 30, 1884, may be found the following entry: "Mr. Brewster called attention to the wholesale slaughter of birds, particularly Terns, along our coast, for millinery purposes, giving some startling statistics of this destruction, and moved the appointment of a committee for the Protection of North American birds and their eggs against wanton and indiscriminate destruction, the committee to consist of six, with power to increase its number, and to coöperate with other existing protective associations having similar objects in view. After earnest support of the motion it was unanimously adopted."

At this same meeting action was taken which proved far

more reaching in its results than was probably anticipated by its originators. The American Ornithologists' Union instructed the Council to prepare and present a proper memorial to Congress, and also to the Canadian Government, in behalf of the Committee on Bird Migration, and to consider what other means could be devised to promote the work. As the result of the appeal to Congress, an appropriation of \$5,000 in aid of the work was secured through the United States Department of Agriculture, and from this humble beginning has grown the present Biological Survey, a Division of the United States Department of Agriculture, which still has at its head Dr. Merriam, the original superintendent, who has gathered about him a staff of well-known ornithologists.

The great value of the work of this important division of the Government is becoming more and more apparent every year, especially in the great mass of educational material that is being published, and in the active part it is taking in the work of protecting both game and non-game birds.

An editorial entitled "The Audubon Society" appeared February 11, 1886, in "Forest and Stream," from which is quoted some facts relating to the organization of the first Audubon Society:

"Very slowly the public are awakening to see that the fashion of wearing feathers and skins of birds is abominable. Legislation of itself can do little against this barbarous practice, but if public sentiment can be aroused against it, it will die a speedy death. While individual effort may accomplish much, it will work but slowly, and the spread of the movement will be but gradual. Something more than this is needed.

"In the first half of this century there lived a man who did more to teach Americans about birds of their own land than any other who ever lived. His beautiful and spirited paintings and his charming and tender accounts of the habits of his favorites have made him immortal, and have inspired his countrymen with an ardent love for the birds. The land which produced the painter-naturalist, John James Audubon, will not willingly see the beautiful forms he loved so well exterminated.

"We propose the formation of an Association for the protection of wild birds and their eggs, which shall be called the Audubon Society. Its membership is to be free to every one who is willing to lend a helping hand in forwarding the objects for which it is formed. These objects shall be to prevent, so far as possible, (1) the killing of any wild birds not used for food; (2) the destruction of nests or eggs of any wild bird, and (3) the wearing of feathers as ornaments or trimming for dress.

At the end of the first six months of its existence the Audubon Society had enrolled over 11,000 members, and it was deemed necessary to incorporate. Steps were taken to that end, and on August 6, 1886, the incorporation was completed in the city of New York, with the corporate title of "The Audubon Society for the Protection of Birds."

During 1888 the tide of bird protection rapidly declined, for the subject seemed to be given little attention in the public press. "Forest and Stream," in an editorial in November, said as follows:

"Essays have been written to demonstrate the foolishness of small bird destruction, laws have been passed to protect the useful species, societies have been organized and tens of thousands of members enrolled pledged against the fatuous fashion of wearing bird skins as dress; arguments, pleas, appeals to reason and appeals to sentiment have been urged; and what is the outcome of it all? Fashion decrees feathers; and feathers it is. The headgear of women is made up in as large a degree as ever before of the various parts of small birds. Thousands and millions of birds are displayed in every conceivable shape on the hats and bonnets. This condition of affairs must be something of a shock to the leaders of the Audubon Society, who were sanguine enough to believe that the moral idea represented by their movement would be efficacious to influence society at large. Meantime the reintroduction of feather millinery in no way derogates from the value of the work done by the Audubon Society. It has called attention to the ethical and economic aspects of the question and has educated a very respectable minority to organized action. In the face of this minority thoroughly convinced that indulgence in feather millinery is wrong in itself, or conducive to consequences inimical to human well-being, the arbiters of fashion cannot achieve that complete success they have been accustomed to look for."

By December, 1888, organized effort for bird protection in the United States had practically ceased to exist.

An analysis of the cause of the decline in this important work points to the following reasons: The movement was started and carried on as a single society, the expenses of the same being borne by a liberal and public-spirited corporation that was organized for another purpose. The magnitude of the undertaking was too great for any person or corporation to carry on unaided, the actual physical labor and the great expense were beyond the strength or purse of anything but a coöperative movement among the several states and the contributions of hundreds of individuals. There was also a total lack

of supporting laws, nor was the warden system adopted during the first movement.

The second cycle of bird protection practically commenced in January, 1896, when the system of State Audubon Societies was started by the organization of a society in Massachusetts; this was followed by one in Pennsylvania, and thereafter state organizations followed in rapid succession, until now there are societies in thirty-five states, one territory and the District of Columbia. Many of these societies are large and flourishing ones, some of them being incorporated. The Society in North Carolina is unique in that it acts in that state as a Game Commission with power of appointing bird and game-wardens who can arrest violators of the game laws.

Uniform bird legislation was found to be absolutely necessary and has rapidly been secured, so that at this date the model law is in force in twenty-eight states, one territory and the Northwest Territories in the British Provinces. In addition, the Audubon Societies, individually and through the National Association, have exerted a vast and valuable influence in game-bird protection, having found it impossible not to become interested and involved in this important branch of economics. All of the societies stand emphatically for short open seasons, no spring shooting, non-export, no sale of game, and every known method of preserving the rapidly diminishing game-birds of the country.

Early in 1900 Fashion had again attacked the Gulls and Terns, and dealers said that the demand for these skins far exceeded the supply. An appeal to bird lovers was made by Mr. Abbott H. Thayer, and through his efforts a generous fund was raised which was used for special protection to sea-birds during the breeding season, wardens being employed for this purpose. Mr. Thayer has diligently and patiently worked to continue the fund from year to year, with annually increasing results, so that during the past year thirty-four wardens have been employed, as follows: Maine, 10; Massachusetts, 1; New York, 2; New Jersey, 2; Virginia, 8; North Carolina, 4; Florida, 4; Texas, 1; Michigan, 1; Oregon, 1, and a contract has just been made with a warden in Louisiana.

In November, 1900, an important meeting took place in Cambridge, having as its object the discussion of the Federation of the State Audubon Societies in order to strengthen

the bird-protection movement and more effectually place it upon a lasting basis. A committee was appointed, which reported at a meeting held in New York in November, 1901, as follows:

1. That the several societies retain their individuality, that is, that they be not merged into a National Organization.

2. But in view of the increased efficiency that would always result from some form of union, which would admit of concerted action, it is recommended that,

3. The several societies shall each appoint one member of a committee to be known as the National Committee of the Audubon Societies of America.

4. That the members of the committee may be empowered to represent the societies whenever concerted action on the part of the societies be deemed by the committee expedient.

5. That an annual conference be held.

Since 1901, the National Committee has had charge of the formation of new Audubon Societies, the fostering and encouragement of the new and weaker organizations, the warden system, legislation, and general educational work, and it is also an additional medium of exchange between the several state societies.

In 1904, two communications brought before the National Committee have a direct bearing on bird life of the Pacific, and as the information contained therein is probably not known to many of our readers, they are given below:

Dr. Richmond, writing in behalf of the Smithsonian Institution, says: "We have recently received from the Treasury Department several specimens of birds from the island of Lisiansky, one of the outlying Hawaiian islets, with the following history: Capt. O. C. Hamlet, of the Revenue Cutter Service, commanding the U. S. S. 'Thetis,' was sent to this island for the purpose of taking away certain Japanese who were unlawfully engaged in the killing of birds. No doubt these fellows were collecting plume-birds. The skins were made by the Japanese and have no data or labels attached. The species represented one Albatross, one Tropic Bird and three Terns."

The newspaper account of this slaughter is correct and is given herewith:

"Special Correspondence of the 'Chronicle.'

HONOLULU, June 23.—Captain Hamlet, of the *Thetis*, states that the destruction wrought by the party of Japanese poachers on Lisiansky island to bird life was something appalling. He estimates that they killed at least 300,000 birds, to judge from the number of cases of plumage and the amount of meat they secured. All of their spoil had to be abandoned, but it is properly preserved and will keep for a long time. There are 335 of these cases, the plumage in them being of the highest quality.

"The Japanese who were brought here by the *Thetis* are the remains of a party of bird poachers whose presence on an American island was reported by Captain Niblack, of the United States steamer *Iroquois*, some weeks ago, and the *Thetis* was sent to stop their operations, but she arrived to find them only too anxious to leave their hunting-ground and to abandon spoil which is worth at least \$20,000.

"The Japanese were employed by a Tokio firm, and they fitted out in the schooner *Yeiju Maru* in Yokohama last December. Their destination was Lisiansky Island, a wonderful center of ocean-bird life in mid-Pacific not far from Midway Island. The island is the property of the United States.

"According to their story, they arrived at Lisiansky Island on January 8, and commenced at once to kill birds. They had a staff not only of hunters, but also of skilled taxidermists and skinners, for the birds' plumage was intended for the millinery markets of Paris. The men collected skins and wings by the thousand, the birds being very tame."

The following is the report for 1904 of Mr. W. Alanson Bryan, of the Bernice Pauahi Bishop Museum of Honolulu, a member of the committee:

"As yet no effort has been made to organize an Audubon Society in the Hawaiian Islands, although the matter is under consideration and we hope to be able to effect an organization within the coming year.

"The annexation of Hawaii by the United States has necessitated the recasting of many of the fundamental laws of the country, and, in consequence of the unusual amount of urgent legislation before the local assembly, the modification of the game laws has been deferred; although the subject has been thoroughly discussed and a model bill is at hand which will be presented as soon as it is possible to secure its consideration by the legislature.

"When compared with any other state in the Union, it will be observed that an unusually large proportion of the native land-birds of Hawaii are now considered as being extinct. Fortunately their extermination has been brought about by

causes which it would have been impossible to cover by legislation.

"The subject of the introduction of desirable birds has received attention in years past. As a result, all of the larger islands have more or less thriving colonies of introduced game-birds of several species. The people are aroused to the importance of the introduction of beneficial insectivorous and song-birds, and indications point to the subject receiving substantial encouragement at no distant date.

"The leaflets and circulars distributed by the Audubon Society have little bearing on our local conditions, as none of the birds treated are found here. However, the matter contained in them is of general interest and stimulates observation and inquiry."

NOTES.

By Jared G. Smith.

The bud-rot of carnations is caused by a species of *Fusarium*, and the fungus is always accompanied by a mite which presumably acts as a carrier of the disease, intensifying its severity by sapping the vitality of the plant. Inoculations with pure cultures of the fungus indicate that the *Fusarium* alone may cause bud-rot. There is considerable variation among varieties in their susceptibility to infection.—F. D. Heald in Proc. Nebr. Acad. Sci.

A new exchange is "The Strawberry," a monthly magazine devoted to this fruit, published by The Kellogg Publishing Co., Three Rivers, Michigan. The cover bears the motto: "The Lord might have made a better thing than the Strawberry—but He didn't."

The Hawaii Experiment Station would like to get copies of Bul. No. 4, "The Cultivation of Sisal," by F. E. Conter, and Press Bul. No. 6, on "Vanilla Culture." The edition of each of these is exhausted.

INSECT PESTS IN HAWAII.

The farmers of Hawaii, in common with those of all other countries, will be confronted by serious obstacles, which must be overcome. One of the most serious problems is that of controlling the many injurious insects. As in all other tropical countries, insects are much in evidence. The pests in Hawaii are almost entirely forms which have been introduced from other countries. The principal insects injurious to fruits are the scale-insects, mealy bugs and related species. The sugar planters have to contend with a cane-borer, a leaf-hopper, mole crickets, and others of a more or less destructive nature. Plant-lice, cut-worms, melon-flies, and various leaf-eating beetles, attack garden and field crops. Grapes, ornamental trees and shrubs suffer from Japanese beetles and Fuller's rose beetle. However, it is well to remember that the use of direct, active measures of control will keep these pests in check in Hawaii just as similar methods are used against insect pests on the Mainland. It is certain that precautionary methods, the use of insecticides and cultivation based on the habits and life-history of the insects will contribute to their control. Other drawbacks are the high winds that are prevalent during the winter or rainy season. These high winds often cause loss or serious injury to vegetables and annual crops, but are not considered serious in relation to the cultivation of perennials. As in new countries a number of settlers living together as a community will do better than the same people in isolated locations. Whatever drawbacks there may be, those now living in the Islands have faith that they are such as can be easily overcome.—*Jared Smith in "Agricultural Possibilities in Hawaii."*

FARMERS' INSTITUTE MEETING.

At the meeting of the Farmers' Institute on May 12th at the Library of the Board of Agriculture and Forestry, the following papers were presented:

Co-operative Fruit Marketing by Mr. John Emmeluth.

The Necessity of Growing More Fruit in Hawaii by Mr. Weinrich.

An account of the transaction of the meeting will be given in the June Forester.

BY AUTHORITY.

Notice is hereby given that MR. GERRIT P. WILDER has been appointed a member of the Board of Agriculture and Forestry for the Territory of Hawaii.

G. R. CARTER,
Governor.

Executive Building, Honolulu, Jan. 5, 1906.

Notice is hereby given that Mr. Christian C. Conradt has been appointed a District Fire Warden under the Board of Agriculture and Forestry, for that section of Molokai extending from the land of Pukoo to the land of Halawa, inclusive.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 11, 1906.

Notice is hereby given that Mr. Robert Ray Elgin has been appointed an Honorary Inspector in the Entomological Division of the Board of Agriculture and Forestry for the port of Mahukona.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 11, 1906.

Notice is hereby given that Dr. Harold B. Elliot has been appointed Assistant Veterinary Inspector, under the Board of Agriculture and Forestry, for the port of Hilo.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 12, 1906.

BRUSH FIRES ON TANTALUS.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905 it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of twelve months (12) from date, within that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys, unless the written permission of the District Fire Warden has been first obtained. The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting

the same, or by competent agents of his, until put out." The District Fire Warden is Mr. Walter M. Giffard.

RALPH S. HOSMER,
Chief Fire Warden.

Honolulu, T. H., Feb. 8, 1906.

Notice is hereby given that in accordance with the terms of Act 71 of the Session Laws of 1905,

MR. WALTER M. GIFFARD

has been appointed District Fire Warden, under the Board of Agriculture and Forestry for that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Feb. 8, 1906.

Notice is hereby given that Mr. Thomas S. Kay has been appointed District Forester for the District of North Kohala and that portion of the District of Hamakua, lying between said District of North Kohala and Waimanu Valley, Island of Hawaii, under the Board of Agriculture and Forestry, in accordance with Chapter 28 of the Revised Laws.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Feb. 27th, 1906.

Notice is hereby given that Mr. David Kapihi has been appointed Forest Ranger, under the provisions of Chapter 28 of the Revised Laws, for that section of the District of Kona, Island of Oahu, bounded on the East by Manoa Valley, on the North by the Konahuanui Mountain Range, on the West by Pauoa Valley, and on the South by the makai edge of the Eucalyptus forest, the Makiki reservoir and the foot of Round Top, as far as the mauka boundary of the Judd land in Manoa and Makiki.

C. S. HOLLOWAY,

Secretary Board of Agriculture and Forestry.

Honolulu, T. H., March 6, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 3 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

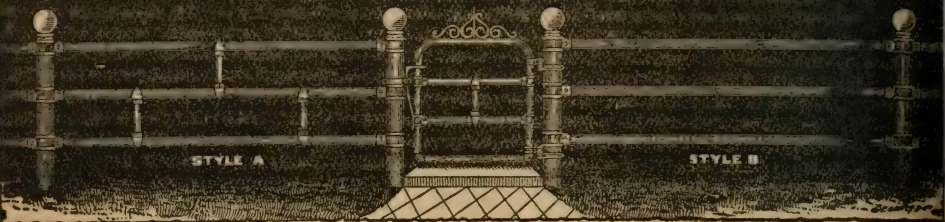
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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Manager THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

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The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

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VOL. III. JUNE, 1906. No. 6.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

JUNE, 1906

No. 6

The cultivation of pineapples on these Islands as a commercial venture, has probably been in progress for a period of about fifteen years. The last five years have seen a very great development of the acreage under cultivation for this purpose, and indications point to the fact that the next few years will witness an even greater extension of the industry.

The difficulties which face Hawaiian growers of agricultural products destined for disposal on the Mainland are unusual and are chiefly attendant upon the vast distance of their market, and also upon the remoteness of many of the plantations from rail and wharf.

Hitherto the method of marketing Hawaiian pineapples, and in fact the system which is in use today, is for each individual grower to consign his produce to some Mainland agent to be sold there upon commission. The result of this is to bring each consigner into direct competition in the Coast market with his fellow-growers, with the effect that prices are at times depreciated below the actual cost of production, and in some cases have fallen so low as not even to be sufficient to defray excessive freight charges.

Not less disastrous to the realization of a profitable return is it that at times the simultaneous arrival of large shipments of fruit from different producers has so overstocked the market that a large proportion of it has been unable to be disposed of at any price, and has thus become an entire loss. After such a "glut" a period has often followed when a Hawaiian pineapple was unprocurable upon the Mainland, and could the shipments have been arranged to arrive at different times, good prices would have been secured for all.

With the increased output of pineapples for this Territory which is now anticipated, the difficulties facing the growers will be greatly accentuated, and it is believed by earnest observers that the success and the existence of many of the plantations depends upon immediate provision being made to obtain more

AUG 19 1907

favorable marketing facilities. The condition of affairs is deemed urgent and unless steps are taken to ameliorate the situation it will become crucial upon the maturity of the present season's crop.

The quantity of Hawaiian pineapples disposed of in Mainland markets till now has been small compared with that received from Singapore, the West Indies, Florida and other countries.

Island pineapples have, as a rule, only been sold in certain of the most accessible Western cities, but as soon as their merits are popularly known, and when a proper distributing system is in operation they should easily displace all competition, for in flavor, uniformity, color and general appearance they are superior to all others. With these preponderating qualities it is believed that a ready market will be found for the entire output of our Hawaiian fruit as soon as the markets can be properly reached, for indications show that as yet the general American markets are untouched by our produce.

Hitherto the island growers have been unable to effect an organization to safeguard their interests, although in past years attempts have been made to unite them. However, the time is now opportune and circumstances demand that if the industry is to be established upon a profitable basis, a coöperation must be formed upon lines similar to those under which the fruit growers of California are so successfully organized. While the system in beneficial operation in California has become in the course of a few years very far-reaching and to some extent complex, it is uncertain that such an elaborately conducted plan could at first be adopted by the Hawaiian growers. With as many interests involved as growers represented, it would probably be some time before that mutual confidence, which is the keynote of success in such an undertaking, could be developed. The merging of all spirit of rivalry and jealousy into one uniform and equitable policy embracing the good of the whole must be appreciated and fostered before the full utility of the coöperation could be developed.

It therefore would seem expedient to endeavor to ascertain a common ground upon which all our Hawaiian pineapple growers would unite for the common good. With an agreement in operation between them, formulated upon even one point of interest, it would not be long before the accruing benefits were such that the agreement would be widened until it embraced as successful a field of enterprise as that covered by the well known Californian organization.

As in every other industry the present position of agriculture has been attained only by patient and continual effort, and each success has been possible only by the accumulated experience of the past. The success of agriculture today is, however, chiefly due to the availability of only a part of the record for, as a general rule, it has only been the result of successful experiment which has been preserved. It is to be regretted that as extensive and comprehensive an account of past failures and only partial successes of experimenters is not available. Were such knowledge disseminated we should be in a position to weigh the possibilities and probabilities of the success of new undertakings under the enlightenment of the whole record and should not so often see the same blunders perpetuated and the same impossibilities attempted by each generation of agriculturists. We would therefore urge the same patient observance and the same perseverance to record cases of failure as has hitherto been given to those of success. In examining the causes of failure and endeavoring to overcome them, the road to success may generally be determined. It is, however, of the utmost importance that the whole of the attendant circumstances of failure be critically viewed, for, if this be not done with intelligence and exactness, the bare record of a failure is calculated to have a far greater and more harmful effect than if the result of the experiment had been allowed to go unnoticed. Man is too prone to be influenced by discouraging statements, and too often in the past the sweeping announcement of the impossibility of attempting certain lines of agriculture has been sufficient to deter their attempt for many decades. Very often such gratuitous dicta are founded upon single experiments conducted by individuals unlearned in the first essentials of agriculture and under such conditions that signal failure was assured. The cultivation of many valuable plants is today pronounced impossible in Hawaii, and many such cases will occur to all our readers. For our own part we believe emphatically that there are very few fruit or flower producing plants of economic importance which cannot be grown as successfully in Hawaii as elsewhere. In every attempt at growing a plant exotic to these islands the first essential is the selection of a suitable habitat with regard to such provision as altitude, rainfall, atmospheric humidity, and soil constituents, and in none of the hitherto recorded failures, which has been brought to our notice, has due respect been paid to all of these. The plants,

which have chiefly been maligned in this respect, are to be found among fruit trees and garden flowers. If a list of the plants, whose cultivation is believed to be impossible in these islands, were submitted to the Hawaii Experiment Station, we have no doubt that fully three-fourths could be freed for the ban which has been thoughtlessly placed upon them.

The display in the windows of the Hawaii Promotion Committee's Hotel street offices affords a conclusive object lesson of the superior advantages of our island products. Mr. Weinrich shows, side by side, specimens of the Hawaiian and the Guatemala sisal plants, and also a selected series of samples of the ropes and cordage made from this useful fibre material. In view of the success which has been achieved by the sisal plantation of which Mr. Weinrich is manager, and of the excellence of the fibre which is produced there, it is a matter of surprise that more similar plantations have not been established in the islands.

We are glad to be able to recontinue the admirable series of Agricultural Notes which was discontinued some numbers ago upon the departure of Mr. Jared Smith to the Mainland. The wide experience of the Director of the Hawaii Agricultural Station has enabled the Forester to publish a valuable selection of statistics and information upon varied agricultural industries, which would otherwise be inaccessible to the majority of its readers.

RUBBER NOTES.

"Unfortunately I have only five acres of rubber yielding at present. I get about \$100 per acre a month profit from them."—*Correspondent in the Ceylon Observer.*

Artificial rubber is no nearer in sight than ten years ago, and seems as remote as artificial gold; but if it should be achieved, chemical rubber would probably be of a low-grade or would cost more than plantation rubber. However, the fall from present prices is not likely to come very soon. One of the largest American importers of rubber has a man in Ceylon now trying to write contracts with rubber plantations there to take their entire output for the next ten years at one dollar per pound, but it is not believed that he is doing much business. The present outlook is that the planters can do better than that.—*Ceylon Tropical Agriculturist.*

FARMERS' INSTITUTE MEETING.

An interesting and profitable Institute meeting was held at the library of the Board of Agriculture and Forestry building, Honolulu, Saturday evening, May 12th. There was a good attendance, and many prominent growers from other islands were noted.

The important subject of coöperative marketing of Hawaiian agricultural products was taken up with enthusiasm, and it is believed some good results must follow.

President Jared G. Smith, in his introduction, read an outline of the organization of the California Fruit Distributors, which is composed of growers, shippers and coöperative associations engaged in the deciduous fruit business.

The committee on coöperative marketing, consisting of Byron O. Clark, chairman; John Emmeluth, James D. Dole, R. H. Trent and Mr. Eames, then presented the following report:

"The practice of growers consigning produce to dealers, to be placed on sale in competition with each other, without any restriction as to minimum price for which the produce shall be sold, is unnecessary and ruinous and should be discontinued.

"We believe coöperative marketing along the lines now in operation among California fruit growers can be made a success for Hawaiian growers at any time that they may agree so to do, but we find they are slow to avail themselves of the remedy; until such time as a coöperative plan of marketing may be perfected, we recommend that the individual shippers establish a minimum price for their produce f. o. b. Honolulu, or Coast distributing point, and refuse to consign any fruit for sale on commission. This will enable the individual to establish a schedule of prices yielding a margin of profit, and your committee believes will be a step towards coöperative marketing, which will be realized in the near future."

In offering this report, Mr. Clark said that it was only signed by two members of the committee, but he believed that it would have been approved by a third if the committee could have been gotten together. It was or seemed impossible to get all the committee of five to meet.

The report met with very general approval, and was supplemented by the reading by Jared Smith of an extract from the

Pacific Rural Press consisting of an article by Alden Anderson, Lieutenant-Governor of California, descriptive of the aims and purposes of the California Fruit Distributors, which is a kind of clearing house for deciduous fruit growers in California which enables the producers themselves to control their market.

General discussion, approving coöperation and the reaching out for a market, followed, the end being that a motion carried that the report of the committee be adopted, and the committee of five retained with orders to endeavor to effect a combination to control the market for the growers in time to make profit of the next year's crop of pineapples. The organization of these is expected to be followed by organization and coöperation along broader lines, so that in time the island growers of tropical and sub-tropical products will reach and regulate the immense Mainland markets which, as yet, have hardly been touched for both fresh and prepared fruit products.

After the discussion, it was made known that J. E. Higgins will go to the Mainland within the next few weeks to study market conditions with reference to pineapples and bananas particularly, to find out why fruit shipped does not arrive in good order, to see whether prices cannot be improved, and to make the experiment of shipping a carload of bananas, pineapples, alligator pears and mangoes from San Francisco straight through to New York.

The following paper was read by Mr. John Emmeluth:

CO-OPERATIVE MARKETING.

The various agricultural enterprises in these Islands are confronted by market conditions, both as to purchase of supplies and the disposition of their crops—practically unknown on the Mainland.

Twenty-one hundred miles distance by water lies between the local port of entry and the nearest Mainland port with which we can exchange commodities.

Add to this the untoward local conditions confronting the majority of agriculturists in getting supplies to their several holdings or their output to the most convenient port of shipment and you have before you the initial cause of the individual grower's lament.

Couple with these factors the constantly varying prices for supplies required in preparing the crop for market on the one

hand, and fluctuation in returns on shipments of goods marketed, caused in part by claims for loss on over-ripe or under-sized fruit, poor packing, or overheating en route, forced sale on account of a glut in the market through overshipments and finally inability to enforce prompt settlements after sales are made and you write the seamy experiences of nine out of every ten agriculturists in this Territory.

Much of the disappointment touched upon in the last paragraph is the direct result of unorganized individual effort, ignorance of market conditions and of the parties to whom products are consigned for sale, with the immediate consequences that advantage is taken of the absence of supervision in the interest of the grower and resulting in the paring down of account sales for causes already noted.

Such experiences as these and the rapid increase in output should point the necessity of individual growers getting together on some basis of joint action in order to avoid the inevitable results of procrastination.

It is highly essential to the success of any joint effort that those associating themselves should do so for the common good.

Men cannot coöperate successfully if the sole bond between them is self-interest.

Effort should be made to operate for the general welfare in the purchase and distribution of the necessary supplies, in securing equitable carrier rates both local and to the mainland, to secure better service by guaranteeing to carriers a stipulated amount of freight in consideration of proper provision for its storage and care in transit; to secure the services of a competent man to look after the care and distribution of fruit at the mainland port; report condition of goods on arrival; pass on all claims for deductions and to adopt such means for the extension of the market as may be approved from time to time by the association.

The expense of such a man would be saved every month in commissions on purchases and increased returns on consignments consequent on his personal supervision of shipments and collections. While these would be among the immediate advantages the more permanent results of his efforts would be found in the extension of business connections and preparedness for marketing a constantly increasing quantity of fresh fruit; this work would be done at intervals between arrival of consignments.

Attached hereto is a tabulation of imports of bananas and pine-

apples into the United States for the three years immediately preceding July 1, 1905. While these figures loom up big as compared with our present output, yet they show a consumption of only one bunch of bananas per year for every three of the population and an even smaller consumption of pineapples, and such pineapples averaging ten to the cubic foot.

While these figures indicate that there is room at the top for all the fruit this Territory can raise in the next twenty years, wise counsels must prevail and the market possibilities be exploited with the same earnestness and enthusiasm as is being evinced in the present extension of acreage in fruit.

No enterprise can be made successful when handicapped with excessive and discriminating carrier's charges. Sugar carried from mill to port at three cents per ton per mile of haul, while fruit pays from four to six times this amount for the same service, is a condition to which individual effort is powerless to apply the remedy.

We have now had about six years of Uncle Sam's influence in these Islands, but there are still wharves and landings where notices informing you that "foods, wares and merchandise can be landed only upon payment of the wharfage fees" to some corporation, are prominently displayed.

Concerted action is necessary in dealing with problems of the kind hereinabove alluded to.

Coöperation is needed to secure favorable legislative action on the matter of establishing an agricultural college, to urge such modification of the present school system as will tend to turn the minds and hands of the rising generation to the arts of the husbandman, to urge the extension of the exemption of certain products of industry and making such exemption permanent and to secure the passage of a law and the necessary appropriation for creating a territorial bureau of industrial statistics.

U. S. importations of bananas and pineapples for the years 1903-04-05:

BANANAS.

	Bunches.	Value.	Per Bunch.
1903	29,711,301	\$8,534,769	.287
1904	25,757,236	7,748,111	.301
1905	38,093,863	9,882,612	.259

PINEAPPLES.

1903.

	Number.	Value.	Each.
Bbl.	20,729,940	\$559,125.00	.027
Bulk	2,750,000	75,280.00	.02757
Total	23,479,940	\$634,405.00	

1904.

Bbl.	2,017,530	\$ 57,969.00	.0287
Cuba	15,900,210	591,532.00	.0372
Bulk	3,104,000	82,123.77	.02646
Bulk	6	.18	.03
Total	21,021,746	\$731,624.89	

1905.

Bbl.	118,860	\$ 3,904.00	.0329
Cuba	23,250,110	777,846.00	.0335
Bulk	2,138,000	58,386.00	.02729
Cuba	280	17.62	.06293
Total	25,507,250	\$840,153.62	

After the reading of a paper by Mr. Weinrich, in which was advocated the more extensive and varied growing of fruits in Hawaii, the meeting adjourned.

AVOCADO PEAR NOTES.

Though few varieties of the Palta have been described, the diversity of form is very great. In general this diversity seems to follow geographical lines, the forms of any particular region being more or less closely related. A very distinct type, with thick hard skin, is found in Guatemala, which promises to surpass in shipping qualities the better known forms.

Young plants may readily be propagated from seed, and budding and grafting can be accomplished, the former method being in common use in Florida.

If anything like the present prices can be maintained, the growing of avocados of good shipping variety ought to become a very remunerative industry.

THE SILO IN AUSTRALIA.

The following information is obtained from an article by Mr. T. Cherry, in the April number of the Journal of Agriculture of Victoria. It is reprinted here in view of the great interest that is now being taken in Hawaii in the conservation of farm food-stuffs as a protection against drought:

The use of the silo is gradually coming into favor all over the State, and at Nhill several have been built and filled this season, principally with oats, barley, or native grass. The object is to provide succulent food for lambing ewes, just when all the grass is dry. Mr. Dahlenberg has opened and fed a good part of the contents of his silo to cows, and is highly pleased with the results,



CONSTRUCTING AN ENSILAGE STACK.

so much so that he has decided to build several more. Mr. Edwards showed me some of his silage, which, though rather dark in color, is very sweet and good. Owing to a good rainfall he will not require to use it this season. An impression is prevalent that if silage is not used the season it is made it will be no good, but this is a mistake. Provided the air is kept away, it will keep good for practically any length of time. Mr. Bond, an older settler in the Nhill district, has been handling silage for ten or eleven years, and when he has not required all the silage in a pit or silo he has filled up again, and that which was left over was quite good when he came to use it another year. Mr. Robinson, of Warracknabeal, told me he has proved the same thing. He won a gold medal, given by Messrs. Cuming, Smith and Company, for the best silage. The silage was not required for feeding at

the time, and he was advised not to open it, but he did, and obtained the medal, then closed it up again until the following season, when it turned out as good as before.

One mistake I notice in filling several of the silos is that the stuff has drawn away from the sides, so letting the air down between the silage and silo, in which case there is considerable waste. This is due to the fact that the middle is kept too full, and the sides not full enough, nor yet trampled enough. The weight of the silage from the elevator continually falling in the middle is almost sufficient to insure consolidation at that part, and the outside should be kept at least three feet higher than the middle, and well trampled. I also feel sure that it would pay to have planks cut the shape of the silo to lay on the top to exclude the air, and on the top of these planks to place weights, either in the shape of posts, sleepers, bags of sand, or whatever is easiest to handle.



SILOS ON FARM, IN AUSTRALIA.

Another mistake is sometimes made in making the silo too great in diameter. This should be proportionate to the number of animals to be fed. King gives the following table as furnishing the best guide as to the diameter of silo, which insures sufficient being removed from the surface daily to prevent any going bad:

Feeding Surface.		Inside Diameter.	
30 cows	150 square feet	14	feet
40 cows	200 square feet	16	feet
50 cows	250 square feet	18	feet
60 cows	300 square feet	19¾	feet
70 cows	350 square feet	21¼	feet
80 cows	400 square feet	22¾	feet
90 cows	450 square feet	24	feet
100 cows	500 square feet	25¼	feet

I have not met any one yet who has tried silage and is not thoroughly satisfied with the result.

PERSONALIA.

Mr. Ralph Hesmer is at present on the Mainland and is expected to return to Honolulu towards the end of July, after an absence of two months.

Mr. F. G. Krauss, Agriculturist of Kamehameha Schools, is relinquishing the work which he has carried on with great success, in order to undertake a series of experiments for the Federal Government in the development of an improved strain of rice for use in these islands.

We are in receipt of a report upon the sugar industry of Peru by Mr. Thomas F. Sedgwick, late manager of the Hacienda Cartavio of that country. Mr. Sedgwick has been engaged for two and a half years in the cultivation of sugar in Peru, and the report furnishes a general idea of the conditions there, and also gives comprehensive data of the Hacienda Cartavio. The conditions in Peru are most favorable to sugar cane growing and to a high production of sugar. The greatest needs of the industry there are the development of water supply and the introduction of modern milling methods and machinery. The report, which is illustrated, consists of seventy-eight pages, bound in cloth and is, so far as can be learned, the first publication printed in English in the city of Trujillo, Peru. The minor textual errors, which have crept into the book, can be readily pardoned when it is remembered that the printers worked in a language with which they were unacquainted. The Peruvian Government has now secured Mr. Sedgwick's services to organize and direct an experiment station for sugar at Lima.

GRAPES.

Grapes are widely grown in the islands, especially by the Portuguese settlers. The principal variety is the Isabella, but European wine and table grapes also thrive. Some wine is made by the local growers. This is sold in the local market. It is of the Madeira type. There are good openings for vineyardists either in the production of wine or in growing table grapes for the Mainland market, as it is entirely feasible to make the vines bear at any season of the year. There is hardly any month when the Isabella grape is not offered for sale in the Honolulu market. There is a big opportunity for some one to come here to Hawaii and grow table grapes for shipment to the Mainland during the period from December to June.—*Jared Smith.*

AGRICULTURAL JOURNALS.

ARTICLES OF IMPORTANCE TO HAWAII IN THE CURRENT MAGAZINES.

The Tropical Agriculturist, Magazine of the Ceylon Agricultural Society, March, 1906.

The World's Rubber.

Banana Flour, by C. Drieberg.

The Avocado: A Salad Fruit from the Tropics, Part II.

The Cultivation of the Grape Vine in Ceylon, by D. F. De Silva Gunaratne.

The Mangosteen.

The Journal of the Department of Agriculture of Victoria, April, 1906.

Summer Pruning, by C. B. Luffmann, Principal School of Horticulture & Small Farming, Burnley.

Garden Notes: The Phlox, by J. Cronin, Inspector Vegetation Diseases Acts.

Agricultural High Schools.

Ducks for Export, by A. Hart, Poultry Expert.

The Lessons of a Dry Summer, by T. Cherry, M. D., M. S.

The Agricultural Gazette of New South Wales, April, 1906.

Uses of New South Wales Timbers, by J. H. Maiden.

Hawkesbury Agricultural College and Experimental Farm. Stack Ensilage, by W. H. Potts.

Sheep at Wagga Experiment Farm, by G. M. McKeown.

Farmers' Fowls, Faverolles, by G. Bradshaw.

Bulletin of the Department of Agriculture, Kingston, Jamaica.

Cultivation and Marketing of Citrus Fruits, by H. Q. Levy.

THE MANGO.

The mango is a delicious fruit, almost unknown on the Mainland. There are some forty or fifty varieties in Hawaii. The tree requires rich soil and a medium amount of irrigation. It can be propagated from seed, in which case there is no surety that it will come true to seed and, also, by grafting, budding and inarching. The fruit ships well in cold storage, retaining its flavor and ripening its color, as well as do the deciduous fruits packed and shipped under similar conditions. The Mainland market is capable of development and will undoubtedly in time absorb large quantities of this king of tropical fruits.—Jared Smith.

NOTES ON THE CARE OF PIGS.

From the Journal of the Jamaica Agricultural Society.

Imported Breeds.—The Poland China, Berkshire and Tamworth are all profitable types of pigs, and if crossed with our native sows, will produce pigs that will mature early and scale 150 pounds and upwards at six months old.

Breeding Sows.—A breeding sow should drop two litters a year, the gestation period is four months, and her young pigs should be weaned at six to eight weeks old. She should not be closely confined. Shortly before dropping she may be penned, her young being allowed to run in and out as they like. While suckling her young she must be liberally fed three times a day and not be allowed to run down in condition.

Young Pigs.—Growing pigs should be kept healthy and fat. At the time of weaning they must receive suitable feed, such as middlings or skim milk to keep them from falling off in condition.

Fat Pigs.—Pigs should be fattened and fit for the butcher at six months old. The improved breeds should weigh at least 150 pounds at six months, and one pound per day should be the minimum gain up to one year old.

Feeds and Feeding.—Experiments in other countries have established the fact that 4 pounds of corn ground and soaked in water will produce 1 pound of pork; but 4 pounds of corn fed with skim milk in proportion of 3 quarts to 1 pound of corn, will produce $2\frac{1}{2}$ pounds of pork.

Imported Meals.—The high price of imported meal and corn will not allow of its being profitably fed to pigs except to a small extent, and then only in conjunction with other feeds. Breeding sows while suckling their young should receive 1 to 2 pounds daily in addition to other feeding if it is found they are falling off in condition.

Salt and Charcoal.—Salt should always be sprinkled over pigs' food, and if they are kept in close confinement a handful of charcoal should occasionally be thrown in the food. A pig should be fed at least twice a day all it can eat up clean.

Green Food.—A pig in confinement must be given some Guinea grass or other green food daily.

Water.—All pigs require pure water to drink and should have access to it at all times. It is not necessary as many people suppose that the pig in confinement should have a mud pool to wallow in.

Bananas.—Bananas, which are one of the staple feeds in Jamaica, can be fed in various ways. Ripe bananas produce the best results, green bananas should be boiled with salt and fed cold. Admirable results have been obtained with green bananas treated as follows: Strip off the fingers and throw into barrels, cover over to exclude the air and leave to ferment, when the fruit is reduced to a pulp bale out the solid mass and feed to the pigs, the vinegar can be stored and ripened for domestic use.

Styes and Pens.—The man who keeps pigs in a filthy sty should be prosecuted; insanitary quarters breed disease. A large run is not necessary for fattening pigs, but if confined in a small space they must be kept dry and clean. A concrete floor is perhaps best, but boards raised a little off the ground do equally well, and when the ground underneath gets foul they can be removed to a fresh place. Above all, proper provision must be made for a sleeping place affording ample protection from rain. For fattening pigs in larger quantities, select an old building (if you have one) and make the roof water-tight, so that the pigs are sure of a dry bed in all weathers; adjoining it fence in two runs sufficiently large to give the pigs plenty of room to root, when the ground in one begins to get foul change to the other.

Lime.—Always disinfect with lime all foul pens after clearing away the manure.

A. H. PINNOCK.

Lyndhurst, St. Andrew.

GARDEN VEGETABLES.

The production of garden vegetables for the market is almost entirely in the hands of Chinese, but products of better qualities than the ordinary varieties commonly grown by these people, find good sale at fair prices. Conditions are such that any settler can grow almost any class of garden vegetables, excepting celery, peas and cauliflower, in his own garden at all seasons of the year. Insect pests and plant diseases are as abundant in Hawaii as anywhere else, but here, as elsewhere, yield readily to the application of scientific remedies. There are good openings in the islands for people who wish to undertake the cultivation of the better class of garden products. Cabbages, peas, sweet and Irish potatoes, green corn, lettuce, parsley, tomatoes and many others grow as well here as anywhere else. Vegetables of the melon and squash types are subject to damage by a fruit-fly, which stings the young fruit and causes it to rot or drop off. Excellent celery and cauliflower are grown at elevations above 3000 feet. Green corn is in the Honolulu market the year round.—*Jared Smith.*

MISCELLANEOUS NOTES.

BY JARED SMITH, *Special Agent in Charge, Hawaii Experiment Station.*

It is claimed by Indian planters that there is a difference in the quality of rubber produced by young and mature *Hevea* trees. Rubber from 5-year-old trees does not command more than 80 cents per pound while that from trees 8 or more years old, sells for as high as \$1.50.

Indian Planting and Gardening states that in Ceylon a 300-acre rubber plantation 8 years old, which had cost \$36,000 for labor and all expenses of management, produced in one year rubber valued at \$91,300. The trees were *Heveas*, planted 200 to the acre. This is a doubtful statement, probable untrue, because only \$140,000 worth of rubber was exported from Ceylon in 1905.

Mr. Ridley, Director of the Signapore Botanic Gardens, has the following to say in regard to rubber prospects:

"The area in which rubber has been produced is almost exhausted of the product, and a large part of that area, (the greater part of Africa,) is utterly unsuited for the cultivation of any rubber plant of any value. The *Landolphias* of Africa are quite unsuited for cultivation and are never likely to come into competition with the cultivated *Hevea* and *Picus*. Over the large area which produced these rubbers and which is now nearly exhausted of its stock, there is little or no ground suited to the cultivation of those rubbers which are possible of remunerative cultivation. The volume of rubber produced by this area must therefore be supplied by the increasing area of cultivation in the Malay Peninsula, Ceylon and a few other parts of the world. Mexico and Northern Brazil may perhaps be able to supply *Castilloa* and *Hevea* rubber in sufficient amount to replace the denuded forests of the Amazons. But in the meantime the demand is increasing and it will be long before the product can possibly be produced in sufficient quantity to fill even the present demand. Rubber then is almost the ideal cultivation for the planter. Rubber is in fact the only product known to me, which, while it has an universal use, has so limited an area of production, and it is also unique in having practically disappeared from a large area which

supplied a considerable proportion of the world's crop, and in which it never can be replaced. *Under these exceptional circumstances it does not seem probable that this product is likely to be overproduced for very many years, if ever at all.*"—Agric. Bul. Straits and Fed. Malay States.

Indian and Ceylon Tea Growers have contributed \$60,000 jointly for the purpose of advertising their product in the United States during 1906. In addition the Indian growers have contributed \$25,000 for the same purpose.

The Florists' Exchange reports the following remedy for red spider: Spray the plants with a weak solution of glue. This kills the spiders, but not the eggs. A weak mixture of boiled flour paste and whale oil soap in water kills both adults and eggs, and a tobacco solution added is effective against other soft-bodied insects. This soap-starch-nicotine mixture is said to be an active remedy for mealy bugs.

One very important point in the control of the melon fly is to pick up and destroy all infected fruit. This applies to tomatoes, green beans, egg plants, melons, gourds and squashes. Destroy the infested fruit.

The world's consumption of jute has risen from 2,260,000 bales in 1894 to 8,800,000 bales in 1904. India is the sole source of supply because of climatic conditions and the cheapness of labor.

Remedies for sore-head of chickens, recommended by the Natal Department of Agriculture, are the following: A 4 per cent. solution of nitrate of silver; or, an ointment of 5 per cent. nitrate of silver in lard. Also an ointment composed of red oxide of mercury 1 part, lard 8 parts. To keep sore-head in check not only treat the birds but cleanse the houses and roosts with boiling hot water and spray with Bordeaux mixture.

The Government of Brazil has decreed a prize of \$10,000 for any one who exhibits a plantation of 100,000 Ceara rubber trees within 18 months from December, 1905. Other prizes are for \$5,000, \$3,400 and \$1,600 for the next largest plantations, the smallest of which in order to gain a prize must be not less than 20,000 trees.

Sixty-five tons of rubber were exported from Ceylon in 1905. The acreage planted to rubber now amounts to 45,000 acres in Ceylon, and about 67,000 acres in Malay, Indian Burmah, Java and Sumatra. Clean, dry biscuit and sheet rubber now commands a premium of 20 to 24 cents per pound over fine Para.

Four million seven hundred twenty-two thousand and eight hundred bunches of bananas were imported into England in 1905. Three million two hundred and sixty-three bunches were received from Jamaica and Costa Rica, an increase of 1,400,000 bunches over 1904.

An organization known as the "Liverpool Institute of Commercial Research in the Tropics" has recently been established for the purpose of protecting and increasing the present supply of rubber; to examine possible new sources of vegetable oils; to investigate the pests and diseases affecting certain tropical crops; and to investigate new fibres and extend the cultivation of fibre plants. An expedition has been sent to the West Coast of Africa by this institute.

In an "egg-laying contest," recently held in England, under the auspices of the "Utility Poultry Club," 144 pullets laid 5401 eggs in 16 weeks, from October to January. The judges gave two points for each egg weighing $1\frac{3}{4}$ oz. or over, and 1 point for each egg under this weight. The birds of each variety in the competition were divided into pens of 12 birds. The first prize went to White Leghorns with individual scores of from 61 to 66 eggs and 500 for points, only 2 eggs out of 251 laid by 4 birds in the winning pen being under $1\frac{3}{4}$ ounces in weight. Buff Orpingtons won the second and third prizes with individual scores of 39 to 75 eggs and pen records of 468 and 441 points. The feeding was generous, amounting to 4 ounces of dry food per bird per day for 10 weeks and 3 ounces for the remaining 6 weeks. The mash consisted of equal parts of chopped green food, meat or green bone, and meal, the latter a mixture of ground barley, midlings, pea-meal and linseed meal. A scanty feed of wheat was given at noon, and a liberal feed at night of wheat, oats and barley. No corn was given in any shape. Water and grit were constantly supplied. The birds received an occasional dose of salt, but no spices or condiments.

ENTOMOLOGICAL NOTES.

(From the Division of Entomology, Board of Agriculture and Forestry, by JACOB KOTINSKY.)

A Press Bulletin (No. 59) of the Florida Agricultural Experiment Station, recently received, is of some interest to this Territory and attention is therefore called to its contents. The "Manatee Snail" (*Bulimulus dormani*) is the subject and Dr. E. H. Sellards, the author. The snail in question has been found feeding extensively upon the black sooty fungus on citrus trees affected with scale, mealy bugs and white fly. As is well known this fungus is not parasitic and results from the deposits of honey dew made by the various bugs upon which it thrives. If injurious at all it is only perhaps because it excludes the light from the leaves it covers. It does, however, make an affected plant look unsightly, and where fruit is grown for the market washing becomes necessary, which entails an expense. For the past two years, Dr. Sellards tells us, this snail has been observed in Florida feeding ravenously upon this sooty mold thus giving the trees they inhabit a clean, healthy appearance. It seems to be a rapid breeder, as a colony is known to have cleaned an orchard of sooty mold in course of a few months. Colonies are easily transferred from place to place and efforts are now being made to establish the snail all over Florida. It has not been observed to feed upon any of the beneficial fungi attacking bugs in the orange districts of that state. In view of the periodical infestation of our avocado pear, citrus and banyan and other trees by this mold, as a result of the presence of the so-called pear blight or avocado pear scale (*Pseudococcus nipae*), it may not be inadvisable for this Territory to consider the advisability of introducing the snail.

SOME INSECT ENEMIES OF POULTRY.

Through the courtesy of Mr. Gerrit P. Wilder the author was privileged to examine and identify several insect parasites affecting the domestic fowls; Mr. Wilder having collected these in quantity and brought to us for study.

Large Chicken Louse (*Goniocotes abdominalis*, Piaget).

In Bulletin No. 5, N. S., Division Entomology, U. S. Department of Agriculture, this species is characterized as follows:

"It is a large conspicuous species about 3 mm. ($\frac{1}{8}$ of an inch) in length, quite broad, the head nearly circular in front and constricted behind; the thorax small the abdomen widening to near the end and terminating abruptly. The head, thorax and legs are yellowish with dark margins and spots; the abdominal segments bear lateral whitish fascia bordered with black."

Numerous specimens on chicken feathers collected by Mr. G. P. Wilder in Honolulu.

The Variable Chicken Louse (*Lipeurus variabilis*, Nitzsch.)

The description in op. c. is as follows: "It is about 2 mm. (1-12 of an inch) in length, the body elongated of a whitish color and smooth and shining. The margins of the body are black; the head is large, rounded on the anterior margins and the whole appearance sufficiently distinct from any of the species infesting chickens, so that there can be no difficulty in distinguishing it at a glance."

Numerous on chicken feathers collected by Mr. G. P. Wilder in Honolulu.

The Pigeon Lipeurus (*Lipeurus baculus*, Nitzsch).

Following is the description in the above cited work: "It is about 2 mm. (1-12 of an inch) in length, the body very slender; the head and thorax are of a bright reddish brown color, while the abdomen is rather dusky with a series of patches of a brown color corresponding with the segments of the abdomen. So far as known this species is confined to pigeons and there seems no danger of their being transmitted to other fowls with which they may associate."

One specimen on pigeon feathers collected by Mr. G. P. Wilder in Honolulu.

A CHICKEN FEATHER MITE.

Immense numbers of this mite were collected by Mr. G. P. Wilder on the chicken feathers and brought to this office for study. Its identity has not as yet been ascertained but it is doubtless one of the common poultry pests.

REMEDIES:

The most comprehensive advice for keeping poultry free from parasites is cleanliness. A hen house frequently swept and white-

washed and once or twice a year thoroughly sprayed with kerosene emulsion and the hens dusted with pyrethrum powder or buhach and finally careful inspection and quarantine of new additions to the flock will keep the fowls free from these pests. An old hen house well stocked with parasites is best burned and replaced by a new one. A house in good condition, if found infested, should be thoroughly sprayed with kerosene emulsion several times at intervals of about 10 days, treating the fowls in the mean time to a dusting of pyrethrum powder. Ordinary road dust, by the way, is good insecticide in itself and the hen that sits down in the dust and scatters it over her back is doing it for relief from annoying parasites. It should be the business, therefore, of every chicken grower to provide his stock with means of getting a good dust bath. As probably none of the poultry houses on these Islands can be made air-tight without much trouble and expense the question of fumigating them need not be considered.

ENTOMOLOGICAL INSPECTION REPORT.

May 16th, 1906.

To the Honorable Board of Agriculture and Forestry of Hawaii.

Gentlemen:—Since my last report, dated March 7th, I have the following statement to submit to you:

Eighty-four (84) steam and sailing vessels from outside this Territory have entered the port of Honolulu and brought eighteen thousand nine hundred and forty-five (18,945) packages of fruits and vegetables as freight. One hundred and eighty (180) parcels and packages by Wells, Fargo Express and Mail and eighteen (18) loose lots of plants by passengers.

Among the plants by freight from Japan were five (5) tea bushes that were seriously infested with the partial "mining" scale *Pseudaonidia paeoniae*. This pest also attacks orange, camellia and a number of other plants. In the same case was a plant of *Lespedeza bicolor*, a flowering shrub which was infested with a species of scale, *Aspidiotus*, unknown to me. The tea plants and the *lespedeza* we destroyed by burning and the balance of the plants, case and packing were fumigated with hydrocyanic acid gas.

On March 8th, five hundred (500) choice orchids arrived

from Manila and were treated with the same kind of gas. More grape vine cuttings arrived from California and were submitted to the fumes of bi-sulphide of carbon.

Two more plants of weeping lantana arrived by mail on March 23rd; the owner was notified over the telephone by Postmaster Pratt that they were held, as such plants would be as serious a pest as the up-right growing species. The owner stated that they were intended for hanging baskets on the porch; that, however, would not prevent birds from eating and distributing the seeds broadcast over the land, so the plants were burned. From Florida came by mail two tea plants and one *Sanchezia nobilis*, infested with scale insects; the plants were burned.

Two dwarf cedars (*Retinosporas*) from Japan were infested with an undetermined "mealy-bug" and were destroyed.

Mr. G. R. Ewart, on his return from Central America, brought with him in his baggage a package of Maragogopie Coffee seed, a very large and excellent variety that commands the highest price in the London market. Mr. Ewart submitted the seed to us for inspection. Upon examination no insect life or fungus disease could be detected. We, however, treated the seeds to a bath of Bordeaux mixture, after which he turned them over to Mr. Haughs, who will grow them for one season to test before planting them in permanent locations. This variety is said to thrive 100 feet above sea level to any elevation where Arabian Coffee grows and is very free from disease. This may prove to be a valuable acquisition to this Territory.

A small box containing two small bags of soil came from Fiji for analysis. Upon examination the only thing found therein was a small land shell.

On the S. S. "Manchuria" came one case of sugar cane from Formosa. Before inspection we took the precaution of fumigating it with hydrocyanic acid gas, after which, on inspection of the top layer of the cuttings in the case we found nearly every bud had been eaten out by some insect entering the bud and making its exit through a small hole between the joints, even to the top of the cane. The holes were from one-thirty-second to one-sixteenth of an inch in diameter, causing a slight discoloration or souring of the juices. The stems had considerable smut, probably caused by mealy bugs, as we found a few. No further inspection was made and all, including box and packing, was burned.

From Washington, D. C., came by mail a small white historical oak tree; upon inspection we found a root borer which we dug out, it measured about half an inch long. No further evidence of insect life was found, the tree was fumigated and passed.

On May 11th we received from Prof. Koebele then on the Mexican border, two jars and a small box containing beneficial insects for "mealy bugs" and "horn-flies" which were turned over to Mr. Kotinsky for propagation.

Through your consent and at the request of Acting Governor Atkinson and Mr. J. B. Castle, Mr. Kotinsky has three times visited with them the Molokan settlement on the island of Kauai, in the capacity of Russian interpreter. A portion of the time when on such missions he also devoted to entomological work. We had received information from a merchant on that island that his leather and some other goods were attacked by insects (*Cutorama mexicana*, Cher.). I requested Mr. Kotinsky to call and give the owner the necessary information regarding fumigation with carbon bi-sulphide, which was done.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

STACK ENSILAGE.

In many countries provision against inevitable drought and against periods of shortage of fodder has been made by means of the ensilage stack. Although good results have accrued from this method it should never be resorted to where a proper silo may be constructed, as the latter is in every way more satisfactory and economical. In constructing an ensilage stack it is of the first importance to exclude air by close packing and advantage may well be taken of a disused pit or barn. The fodder to be preserved should be stacked butt-end outward and care must be taken to insure as great pressure as possible. To obtain this heavy lumber should be placed upon the fodder at the end of each day's work and only removed when the work is resumed. Even distribution of weight must be obtained by laying each layer evenly and by maintaining a regular contour. Upon completion of the stack the lumber should be left upon the top and the whole covered in such a way as to exclude rain. Small stacks are very extravagant as the fodder for a foot inwards is useless for feeding.

A metal pipe built perpendicularly into the stack provides an easy way of determining the temperature by means of a thermometer attached to a string.

*BY AUTHORITY.**SPECIAL WARNING NOTICE.*

FIRES TO CLEAR LAND—WAIALUA DISTRICT, OAHU.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has been first obtained, within that portion of the District of Waialua, Island of Oahu, lying within the following boundaries:

On the South by the Waialua-Waianae District line, on the South-west by the Kaukonahua Stream; on the West by the Waialua Agricultural Company's new ditch from the Wahiawa dam and an extension of the line of the same, following approximately the 700 foot contour, to the Waimea boundary; on the North and East by the Waialua-Koolauloa District Line.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. A. M. Nowell of Waialua.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., March 7, 1906.

DISTRICT FIRE WARDEN—HANA, MAUI.

Notice is hereby given that Mr. John Chalmers has been appointed District Fire Warden in and for the District of Hana, Island of Maui, under the provisions of Act 71 of the Sessions Laws of 1905.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., March 9th, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

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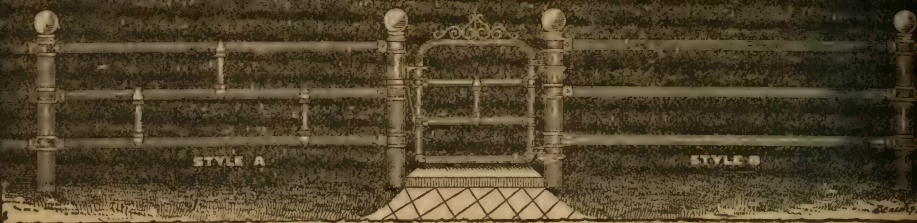
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

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VOL. III.

JULY, 1906.

No. 7.

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OF

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OF THE

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

JULY, 1906

No. 7

Mr. Weinrich's paper advocating the extended cultivation of improved varieties of our local fruits is timely and we hope that its publication will tend to bring about a greater interest in this important subject. There is no doubt that Hawaii could not only fully supply the local fruit market with many varieties now imported, but could also ship enormous quantities of such fruits as mangoes and avocado pears to the mainland. The replacing of the large importation of citrus and other fruits with our local produce could be brought about most expeditiously by endeavoring to attract a class of white agriculturists to establish small fruit orchards to the Territory. Many fruits can be grown in these islands as readily and with as little capital and labor as on the coast, and in some cases the fruit-growing possibilities of Hawaii are unexcelled. The fig, for instance, can be grown here as prolifically and of as good size and flavor as anywhere else, and there is no doubt that in a very short time and at little expense a few acres of fig trees could be made to give a profitable return. Dried Hawaiian figs should be second to none, and if carefully prepared would easily replace the product on which California prides herself. In the cultivation of choice mangoes, avocado pears, figs, bananas and other fruits the opportunity for industrious workers are unsurpassed, and if proper advantage is taken of our climate and soil the time will not be far off when Hawaii is looked upon from the mainland as a great fruit-producing country. As Mr. Weinrich suggests, a book descriptive of our local fruits would be very acceptable, not only to tourists, but to the general public. It is imperative, however, that if such a publication be attempted on any scale it be prepared by one having a sufficient knowledge of the subject, not

only derived from practical local information, but founded upon an intimacy with the comparative pomology of other countries. There are probably not less than one hundred species of fruit trees in Honolulu, irrespective of innumerable varieties, and in some cases an extensive knowledge of botany is necessary to elucidate many errors and perplexities of local and popular nomenclature. Although such a work would be somewhat extensive, it is none the less necessary, but until such can be accomplished we hope that a small brochure will be prepared containing a popular description of our more common fruit trees and an illustration of each.

The Forester contains this month a very interest series of "Notes" by Dr. John Gifford, Agent of the United States Bureau of Forestry, upon Agricultural conditions in Southern Florida. As the locality dealt with is the only part of the mainland of the United States which approximates in climate and products to Hawaii, the information supplied is of particular value to our readers. It is to be hoped that Dr. Gifford's notes will be but the first installment of many others.

Messrs. Byron O. Clark, D. B. Murdoch and other gentlemen have also kindly promised to keep the Forester supplied from time to time with local matters of agricultural interest. An endeavor will be made to extend and render this feature of the paper permanent.

The current number publishes a graduation essay delivered at the Kamehameha Manual School commencement on June 3rd, entitled "What Science has done for Agriculture." The author says of the Kamehameha curriculum: "It is not intended to make us men of science, but rather to give training to enable us to make of use the results obtained by scientific men." If this is accomplished successfully the desire of the founder of the Kamehameha Schools will have been fulfilled.

Mr. Ralph Hosmer, Superintendent of Forestry, has returned to Honolulu after a successful visit to the mainland.

NOTES OF THE PINEAPPLE INDUSTRY ON MAUI.

BY MR. D. B. MURDOCH, Paia, Maui.

The hopes of the smaller agriculturists on Maui are largely centered in the pineapple industry. Excellent results have been attained along other lines by Mr. E. H. Bailey and others, in the upper Makawao district, but for a steady source of income there appear to be few things to pit against the raising of pineapples, unless possibly rubber.

Quite a number of pines are being raised by Portuguese farmers on the higher lands of Kaupakulua, at an elevation of about 1400 feet, but the more serious efforts are being made at Haiku, where the results continue to come up to, or even exceed, the early prognostications.

The chief growers in that district are the Haiku Fruit & Packing Co., the Haiku Sugar Co., H. M. Alexander, C. G. White, W. I. Wells, Jas. Lindsay, O. O. Burns and E. H. Bailey, also at Puuomalei, W. O. Aiken. Outside the area brought under cultivation by the two above-mentioned corporations, fully 150,000 plants have been set out by the independent planters during the past six months, and this number would probably have been doubled, had it been possible to import a larger supply of plants from the other islands.

On account of the summer crop ripening much earlier than usual, the pines average in weight perhaps a little less than those of last year, but are not much the worse for that, being still a fine average size for profitable work in the cannery. The fields certainly present a splendid sight, with unbroken rows of fruit, 9000 to the acre.

The summer pack of the Haiku Company will amount to over 10,000 cases. Late reports from the American market are most encouraging, and good prices for the Hawaiian product should rule for some time to come.

Excellent land can still be obtained in the district at reasonable rates, and there is no doubt that the Haiku colony will grow considerably during the next year or two.

NOTES FROM SOUTHERN FLORIDA.

BY DR. JOHN GIFFORD, *Agent U. S. Bureau of Forestry.*

Owing to the facts that the only tropical territory in the mainland of the United States is Southern Florida, that the cultivation of several strictly tropical fruits and vegetables is now in extensive operation, that the region is in close touch with the West Indies, and at the same time near the northern markets both by water and rail, the writer is of the opinion that notes from this district might be of interest to the people of Hawaii.

The Florida East Coast Railroad, although not an ideal concern, has been influential in opening up and developing a vast region of great possibilities. For some time the terminus has been Miami, with direct connection by steamer with Nassau and Havana, but now the daring project of extending the line through swamp and glade, across miles of water along a string of islands, called the Keys, to the city of Key West, is now actually nearing completion, although the work of finishing the bridges will still consume some time. With the help of ferries, however, rail communication with Havana is near at hand. It is stated that Pullman cars will be carried from Key West to Havana on heavy ferry boats and that the journey across the Gulf stream will only consume from four to five hours.

Our vegetation is tropical and the nearest point of the Bahamas, which belong to Great Britain, is only about fifty miles distant.

At present we are in the midst of the pineapple season. The crop on the Keys is now almost picked and the yield for this season is estimated at 40,000 crates. The pineapples on the mainland, which are a few days later, are now being rushed to northern markets by the train load. Pineapples are selling from \$2.75 to \$3.00 per crate, which is considered a fair price.

Limes are also being picked and are in great demand. These are grown mostly on the Keys, since the Key lime is of fine quality and ships or carries better than mainland limes. They are bringing \$1.25 per hundred. If this price holds there will be fortunes made in this fruit within the next few years, since large tracts of virgin hammock soil are being cleared and planted on the Keys along the line of the railroad extension. As to mangoes, the crop is not large this season, but many of the trees of high quality which have been inarched, will begin to bear for

the first time. I refer to the *Alphonso, Gordon, Lathrop and Mulgoba varieties, which promise to be far superior to any of our common seedling stock. It is stated that the Cambodian mango, which is a distinct species, breeds true to seed and is of fine quality. If so, it is a great boon, since the process of inarching the mango on a large scale is tedious work and not altogether satisfactory.

The people of Florida feel that in the Trapp avocado they have a prize. This variety holds its fruit until late in winter when the price is enormously high. Ordinarily our avocados ripen in late summer and fall. This tree, now growing in Coconut Grove, Florida, probably came originally from Cuba via Key West.

The avocado is ordinarily called the alligator pear, but is it not time to drop such an inappropriate name? It is not a pear and the word alligator in this instance is nothing more than a bad corruption of the Mexican avocado.

Speaking of names, we have been calling the sapodilla by its wrong scientific name. The name *Achras Sapota* belongs to another plant, and according to Coville *Sapota Zapodilla* by the rules of botanical nomenclature is now its botanical title. The Mexicans call it sapote. Why do we call it "sapodilla," which is merely the diminutive of sapote? So far as I know there is no big and little sapote, in fact, the only other sapota is the white sapota or "sapote blanco," which is very unlike and dis-

* The following description of varieties here named are quoted from Mr. Higgins' recently published Bulletin on the Mango. The numbers refer to those in Mr. Higgins' list:

35. The Alphonse, Alfoos, or Alfoos. This is one of the most noted of the India mangoes. Size, medium to large; color, greenish yellow on the unexposed side and running to yellow on the exposed side, which is overlaid with light red; peeling qualities excellent; texture excellent, may be readily eaten with a spoon; flavor unique, with a peculiar mingling of acidity and sweetness in the bright colored fruit.

37. Mulgoba. Form roundish, oblique, reniform; size, large, weighing from three-quarters to one pound; surface smooth and undulating; color yellow, beautifully blushed with red and faintly dotted with numerous brown dots; skin thin, tough, tenacious; seed reniform, oval, rather large; fiber scanty, fine and tender; flesh rich, apricot yellow, very tender, melting and juicy, sweet, rich, fragrant; quality very good.

42. Cambodiana. A very choice variety recently introduced from the Section of Seed and Plant Introduction of the United States Department of Agriculture.

tantly related to the sapodilla. We have a fruit called the mamee sapota, but this also is a very distant relative to the sapodilla. Why not call the alligator pear, the avocado, and the sapodilla the zapote?

The one great problem next to the railroad construction to Key West which is now being ardently discussed, is the drainage of that vast territory called the Everglades. It is the pet project of the present Governor. Already work has begun. Some day it will be one great patch of vegetables and cane. Our representative in Congress has asked to have three million dollars diverted from the irrigation fund for the drainage of the federal land in the Everglades. Of the progress of this project I will write more in another letter.

How accidentally strange foreign plants get introduced by the greatest of all factors in plant introduction—the hand of man through the help of the mails. How indirectly too these often pass from friend to friend. One of my neighbors says, “now here is a cherimoyer, it is unlike all other cherimoyers in this district. A friend sent the seed by mail from Callao, South America.” Another says, “this mango is different from any I have seen before, a missionary friend sent it from a remote section of India.” Only this morning a friend called and said, “I have two strange trees on my place. They are now in bloom. They were there when I purchased the property. I have no idea what they are.” A botanical study of the flower soon revealed that the tree was none other than *Kigelia africana*, the sausage-tree of Equatorial Africa.

I don't know whether you have it or not in Hawaii. I sent some seeds to your forestry department last year, but the Florida madeira, which is the true mahogany, is worthy of extensive planting. On our Keys it grows on coral rocks close to the sea, so close in fact that it must get salted at times. It grows in the rock with little soil, stands strong winds and yields the king of all woods. In spite of the fact that our boatmen are constantly cutting it for boat frames, cleats, etc., it is still quite abundant. In addition to being so useful and universally known, it is highly ornamental. Another tree which I saw in Porto Rico which pleased me because of the value of its wood and the beauty of its foliage and flowers is the *maga* (*Thespesia grandiflora*). Like the mahogany, it grows close to the sea on coral rock. I have tried in vain to get seeds of this valuable tree.

REPORT ON HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, June 20, 1906.

To the Honorable Board of Commissioners of
Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Owing to the disaster in San Francisco and the consequent interruption in ocean transportation during the past three weeks, besides the fact that May is usually a dull season for the shipment of trees and plants, we have very little to report since your last meeting (May 16th).

During this time there arrived in port thirty-one (31) steamships and sailing vessels from outside the Territory. We found thereon six thousand four hundred and nineteen (6419) packages of fruits and vegetables and seven (7) cases and boxes of trees and plants, besides forty (40) packages of plants and seeds by mail.

ANOTHER FUMIGATORY.

Heretofore, when necessary to disinfect any plants arriving by mail, we have had to remove the plants to one of our fumigatories on the docks. With the Executive Officer's consent and Postmaster Pratt's permission we have had a fumigatory made and established in the postoffice, which will expedite such work in the future. As no fire is required in our fumigating work, there is positively no danger of fire to any building.

NEW ECONOMIC TROPICAL PLANTS.

One Wardian case from Ceylon arrived via Hongkong containing an assortment of tropical plants for experimental purposes. They were fumigated and the soil packing was destroyed. Two plants were infested with scale insects.

INFESTED CACTI CUTTINGS.

Seven cuttings of Cacti from California infested with scale and mites were destroyed by tying weights and dropping them into the harbor.

RICE WEEVILS.

Three packages of sorghum seed came by mail from New York, that were found slightly infested with "rice weevils" (*Calandra oryza*). This we successfully treated with the fumes of carbon bisulphide.

INFESTED MANGO SEEDS.

On Sunday, June 10th, the transport "Sheridan" arrived from Manila. In her mail she had a tin box of mango seeds packed in fine charcoal. Upon inspection the insides of the seeds were seriously infested with very small eight-legged silvery mites. The owner was notified and the condition of the seed was shown to him, after which the seed and packing, including the wrapper, were burned.

MANGO WEEVIL.

In my report to you, dated October 2, 1905, I called your attention to the existence of a mango fruit pest that was found infesting the seeds of that fruit in two sections of Oahu. Mr. Austin and I immediately visited the district, but found the crop was over for the season. Upon an examination of a few dry seeds found under the trees we discovered several living larvae and beetles. We called the attention of the superintendent of the estate to the fact and requested him to have all seed carefully collected and burned, which was done. During the present crop of mangoes we have made a careful inspection to ascertain the extent of its spread and am sorry to report that it is more widely distributed than any one that has taken interest in this was aware.

Mr. Austin and I visited Moanalua and the valley adjacent and estimate that over seventy-five per cent. of the present crop contains the pest from very small larvae to pupae. No mature beetles were found during our examination, even with collecting sheets.

During 1905, Mr. D. L. Van Dine first called public attention to this beetle on Oahu, but previous to that Mr. S. Wilder called the attention of his brother, Gerrit, to a beetle found by him in a mango seed from Moanalua, which he submitted to Prof. R. C. L. Perkins of the Hawaiian Sugar Planters' Association. Mr. Van Dine estimated that sixty per cent. of the fruit was attacked,

which indicated that the beetle had been here for some time. An elderly Hawaiian living at the head of a small valley we visited informed us that he found the beetle three seasons ago. As mangoes have been freely sold and distributed from the infected districts, I fear that it has now been scattered over this island and probably carried to others of the group. As the mango trees loaded with fruit in the infected district overhanging the public thoroughfare and a district school is located in the midst every facility has been given for the pest's distribution. Our inspection extended from Palama valley, in Honolulu, to within a mile of Pearl City, wherein we found the pest, so I feel confident from the large size of the trees and character of the soil and undergrowth that it will be impossible to stamp it out of the Territory, even by the destruction of the present or two succeeding crops, so on that account I would not advise your Board to expend any money in the attempt.

While the weevil is found inside there is no evidence of where it entered and no damage appears to be inflicted upon the fruit other than destroying the germination of the seed.

BENEFICIAL INSECTS.

In my last report to you I referred to the receipt of several beneficial insects from Prof. Koebele, which were turned over to Mr. Kotinsky for propagation. The past two weeks he has liberated two colonies our doors and has others in breeding jars in the office.

Respectfully yours,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

CASTOR OIL.

The uses of castor oil are manifold. Besides its ordinary medicinal use as a laxative or purgative, if well rubbed into harness it makes the leather water-proof, keeps it from being touched by cockroaches or rats. It can be used instead of soap in making kerosene emulsion for spraying or washing orange trees. It is a good insecticide and fungicide if used with one part of kerosene, one part of sweet oil to one part castor oil. This will kill hair lice, cure ring-worm and mange on animals, cure scaly-leg on fowls and also mild cases of yaws in fowls if painted on the eruptions, and will kill ticks, fleas and bugs.—*Journal of the Jamaica Agricultural Society.*

ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY, BOARD OF AGRICUL-
TURE AND FORESTRY.

BY JACOB KOTINSKY.

THE TOBACCO SPLITWORM, AN ENEMY OF TOMATO, EGG PLANT
AND POHA IN HAWAII.

Phthorimaea operculella, Zell.

The writer has frequently found a caterpillar within tomatoes bought in the market. After several attempts he has succeeded, in March of this year, to rear a pretty, silvery grey moth. A month later a large number of the moths were raised from the splitworm found at work in egg plant leaves and from a number of them hidden beneath the calyx leaves adhering to the fruit. In January of this year, Mr. R. V. Woods, a valuable and obliging correspondent of this office, from North Kona, Hawaii, sent us some stems of Poha or Cape Gooseberry (*Physalis peruviana*, L.) into the upper portions of the stems of which a caterpillar was found boring and from this caterpillar the above moth was bred. Specimens of each of these were sent to the United States Bureau of Entomology and were there kindly identified with the above by Mr. A. Busck. In the "Hawaiian Forester and Agriculturist," Vol. II, pp. 76-79, also Bulletin 10, pp. 7-9, of the Hawaii Agricultural Experiment Station, Mr. Van Dine records the insect as occurring in Hamakua, where it is injurious to tobacco. He also gives there illustrations of the larva, pupa and moth. It is well to bear in mind that the food plants above enumerated, including tobacco, are members of the same plant family, *Solanaceae*. Its habits in the various plants, however, do not seem to be identical, since it lives upon the leaves of the egg plant and tobacco, in the fruit of tomato and the stems of poha. As Orientals are principally engaged in the cultivation of vegetables upon these islands, we hear very little complaint of insect injury to that class of plants. As a matter of fact, however, the writer has observed more instances of damage to tomatoes by this caterpillar than by the melon fly (*Dacus cucurbitae*, Coq.), which he has observed in only one instance in tomatoes. Upon the egg

plant the larvae had evidently gathered beneath the calyx for protection during pupation, the principal injury being done to the leaves. In the pohia the damage was very serious, since the injury to the stem precluded blossoming and consequent formation of fruit.

NATURAL ENEMIES.

From the pohia stems received from Kona a specimen of *Chelonus Blackburni*, Cam., was bred. This is a good sized, four-winged fly—i. e., good sized for an internal parasite—which cannot be mistaken because of the strong contrast in color between the apical segments of the abdomen which are pale yellow, the rest of the insect being black. From the tomato and egg plant worms another parasite was bred; this was named by Dr. Ashmead, through the kindness of the United States Bureau of Entomology, as *Limnerium polymesia*, Cam. This insect Mr. Perkins tells me is more or less common over all these islands and doubtless does a good deal of good. It is evidently, however, not sufficient to materially check damage by the splitworm since in either instance the number of moths bred exceeded many times that of the parasite.

REMEDIES.

Clean culture, with all it implies, is doubtless the very best means we have at present for combating this insect. By clean culture we mean the eradication of all foreign, especially allied plants, from between those cultivated. The removal of all rubbish from the vicinity of the plants will deprive the caterpillars from shelter during pupation and expose them to attack by natural enemies and other untoward conditions. Frequent cultivation of the soil between the plants will strengthen them at the same time destroying what larvae may be harbored beneath the surface. Finally, good attention to the plants in the way of an ample supply of food and water will invigorate the plants to overcome what injury might have been done to it.

WHAT SCIENCE HAS DONE FOR AGRICULTURE.

Graduation essay delivered by Ire Yowell, '06, Kamehameha Manual School commencement, June 30, 1906:

"The ideal agriculture maintains itself. It is able to thrive forever on the same land and from its own resources. The ideal farm becomes more productive and better stocked with time, and this without the aid of outside contributions. But such conditions are only possible by the application of scientific methods and science.

Modern agriculture owes its wonderful development to the rapid advancement of scientific knowledge, and the application of scientific facts and methods to agriculture pursuits.

Other things being equal the most successful farmer of today is the agriculturist who knows the reason why as well as the how. The spirit of enquiry, observation, patience, accuracy and systematic attention to all farm operations, and the love for experiment, is the scientific spirit, and in no field of endeavor more than in agriculture is this spirit more necessary for advancement.

Agricultural science in its fullest meaning comprehends a large number of subjects. It includes something from nearly every department of human learning. But the art of agriculture is based more directly on the natural sciences of geology, meteorology, physics, chemistry, botany, physiology and mechanics. Today it is no less concerned in political and social economy.

Scientific agriculture, as now accepted, dates from the investigations of the great German chemist, Liebig. A little more than a half century ago he laid down the broad principles which, with few exceptions, have borne the test of time.

By his teachings we know that a fertile soil contains all the elements of plant food. Each drop removes a portion of these ingredients, some of which are replaced by air and water, others are lost if not replaced by man.

While he recognized the importance of humus as a source of plant food as held by his predecessors, he further made clear that the ingredients of ash are essential to vegetable growth. The importance of phosphates in the nourishment of crops was his discovery, and it was he who suggested their source. It was thus that science entirely revolutionized the methods of manuring and created the new and important fertilizer industry.

Based upon these discoveries the German government instituted experiment stations. Other countries were quick to follow in establishing these facilities for scientific investigations. Every civilized country in the world now recognizes the immense importance of these institutions to their agricultural resources.

In the United States particularly has the government been quick to give the farmer every scientific aid possible. No better illustration of the value of such aid to agriculture could be given than to point out the results obtained by the United States experiment stations, and especially should attention be called to the splendid scientific work being done by the Hawaiian Sugar Planters' Experiment Station of Hawaii, in the aid of our staple crop, which it was my recent privilege to be shown in all its many phases.

Perhaps science has given no greater aid to agriculture than in working out the nitrogen problem. We owe the solution of this problem to the science of bacteriology.

It was formerly thought that plants absorbed their nitrogen by means of their leaves. But we now know that the agency of bacteria inhabiting the root nodules of leguminous plants, such as clover and peas, are the only means of assimilating nitrogen directly from the air. By this knowledge we are now enabled to make fertile otherwise sterile soil. Upon the investigations of Prof. Nobbe of Saxony, and others, is based the recent theory of soil inoculation with nitrifying organisms.

The science of bacteriology is also to be credited with the remarkable advance in dairying. The souring of milk, the ripening of cream, the flavor of butter and cheese, is now directly traced to the action of bacteria. In consequence the rule of thumb butter-making days are a thing of the past.

It is because of the importance of pure, wholesome milk as an article of diet for our students, and because dairying is among the most intensive divisions of agriculture, including as it does, every branch of farming, and the sciences related to it, that dairy husbandry has been given special prominence in our agricultural department at Kamehameha.

Here the student begin with the tillage of the soil, cultivating and harvesting the crops, compounding feeds, feeding and milking the cows, testing the milk, separating the cream, and making butter. He not only assists in the practical care and

management of the dairy, but he learns the underlying principles of operations and processes as well.

It is not intended to make us men of science, but rather to give a training to enable us to make use of the results obtained by scientific men.

The physical properties of the soil and their bearing upon its fertility is a subject which in recent years has received much attention from scientific investigators. The knowledge gained from agricultural physics is responsible for the striking results which can be produced by skilful tillage and drainage even without the aid of fertilizers.

Our scientific knowledge of the structure and physiology of plants is of like recent development. By selection and cross-breeding the present high qualities and productiveness of our staple crops may be directly traced. The improvement of sugar cane, sugar beets, cotton, wheat, fruits, vegetables and flowers are good illustrations.

In this connection the eminent horticulturist, Luther Burbank, should be mentioned. He has given us an inkling of the vast possibilities of plant breeding, which can hardly be estimated. The same holds true in animal breeding, the principles of which are but being understood and utilized.

In the incessant fight which the farmer has to wage against insect pests, and plant diseases, he calls to his aid the sciences of entomology and pathology. Were it not for these branches of science it is doubtful whether today one thriving acre of sugar cane could be found in these islands. It would be interesting to cite examples of work done along these lines. But I commend you to visit the several splendidly equipped experiment stations maintained in Honolulu for Hawaii's agriculture.

Likewise have physiology and sanitation been an inestimable value to the complex art of stock feeding, care and general management. Harnessed to scientific breeding, these sciences more than any other factor, are to be given credit for the wonderful and economic milk yield, prime live stock and the general healthfulness of large herds of farm animals.

Thanks to veterinary science, tuberculosis is being stamped from our herds, and other dreaded contagious diseases are under control.

Much concern in recent years has been occasioned by the wanton destruction of our great forests. But scientific forestry

has stepped in and promises not only the full restoration of past waste, but the foresting of large areas to which tree growths have heretofore been unknown. Our own Tantalus, we are told, was once as barren as Punchbowl. What a contrast has tree planting done for this one spot!

The great reclamation enterprises in the arid west which will convert desert lands into productive fields; the introduction of the mower, the combined harvester, the cream separator, steam and electricity and other advance appliances of mechanics for the more perfect and economic replacing of manual labor are examples of the contributions made by engineering and mechanical professions.

That there is any conflict between science and art, or theory and practice, is an error. They are, as they ever have been and always must remain, in perfect harmony. If they appear to jar it is because we have something untrue or incomplete in what we call our science or else we do not see correctly.

GUATEMALAN COFFEE.

Shortly after 1860, coffee-growing began to take the place in Guatemala of the cultivation of the indigo and cochineal plants that had been grown there for many years previous to the discovery of the chemical dyes that are now the colors known to the commercial world. From that time until recently, the business gradually grew, until in 1902, the coffee crop exceeded 74 million pounds of clean coffee. Only a small portion of the area of the country is adapted to the cultivation of coffee. At present good government coffee lands are very scarce, but when found can be had for about 1s. 3d to 1s. 8d. per acre, and when brought under cultivation with a good stand of trees, are worth from £20 to £100 or more. The coffee of commerce grows in altitudes of 1000 to 6000 feet; the best and most prolific trees at 2000 to 4000 feet. The labor is cheap, from 1½d. to 10d. a day. The industry as yet has not been brought to a very high state. Only in a few cases has an effort been made to crowd the coffee tree to see what they could be made to do. Guatemala coffee is rated very highly in the markets of the world, and is the principal industry of the country, it giving employment to more than one-half of the population for about half of the year, during the harvesting time.—*Journal of the Society of Arts*, October 6th.

THE NECESSITY OF GROWING MORE FRUITS IN HAWAII.

BY MR. WEINRICH, *being a paper read at the last meeting of the Farmers' Institute of the Territory of Hawaii.*

The primary object in giving this paper is to bring before the people the close relation that native fruits bear to the development of the country. We need but look to California to see what fruit culture has done for that wonderful state. We turn our attention to New York to see what grapes have done for that country. We look to Delaware to find that this state is known, if for no other reason, for its peaches. And so we could go through the states one by one and find that nearly every state is known for one or more varieties of its own kind of fruit.

The far-reaching general impression of Hawaii is that it is a tropical country, and naturally one expects to find here all the fruits that are found in strictly tropical countries. Unfortunately this general impression of tropical Hawaii is not carried out in fruit raising. To prove this we need but go to the fish market (Hawaii's fruit market) or any of the other fruit stands in town to see how little Hawaiian grown fruits can be purchased. To my mind this deficiency in fruit growing does more harm, causes more disappointment to the tourists and travelers than can ever be counteracted by all the efforts of the Hawaiian Promotion Committee. By glancing at the menus of the leading hotels we are again confronted by the fact that Hawaii is not doing what it can or what it ought to do in this line.

The chief attraction to the tourist in Hawaii is its uniqueness. This uniqueness should extend, not only to the scenery and people, but also to the food we provide.

It is no doubt true that at any of the leading hotels in town, the serving of Hawaiian grown fruits is rather the exception than the rule. Even when they are served the quality and flavor are of such a nature as to produce a feeling of distaste rather than pleasure.

Take one of our commonest garden fruits, the papaya, and you will be surprised at the difference in taste of those purchased from the Orientals or in the market and that grown in your own yard.

Take another very common fruit, the native orange, and one

finds how inferior in quality it is to the California orange. It is very small and most noticeable of all is its large number of seeds. These objections could be eliminated by proper selection and cultivation. I do not wish to be misunderstood in this that good oranges are not grown here. The fact is that the best oranges in the world are grown in Honolulu, but in private grounds. This private enterprise does not supply the needs of the tourist and the general public.

One striking illustration of native grown fruits is the alligator (or more properly the avocado) pear. It is well known that this pear is the best native fruit we have in the market. This fruit has probably done more to advertise this country than any other of our fruits. Every visitor and every tourist goes away with some impression of this fruit, good, bad or indifferent, but he at least carries an impression, something whereby he remembers the country and that is what we desire. Even this fruit, the best we market, is not equal to that grown in private yards.

How few good mangoes are to be had by purchase! Unless one has friends, having trees in their yards, it is almost impossible to obtain such a thing as a good mango. It should be picked, iced and eaten within a few hours, but not as we find them in the market, having been knocked down from the trees and allowed to ripen in the fruitstands. This treatment takes away all the individual taste and reduces what should have been a luscious fruit into a pulpy mass. One of the most undesirable features of this fruit to a stranger is the flavor of turpentine. This flavor is not found in the better varieties if carefully peeled. These better varieties are only found in private yards.

Last summer I made the experiment of buying some of all the varieties of this fruit I could find in the market and found, much to my disappointment, that not one of them was palatable. It has been my personal experience, and also that of others, that many tourists to this country who have spoken of a dislike for mangoes, have been completely won over by being offered, and eating, one mango of good variety.

Of the several varieties of bananas grown commonly on these islands, the "cooking banana," as it is usually called, is the best we find in the market. This cooked makes a delicious vegetable. As we all know of the "Chinese" banana, the one exported, the best and largest fruit is all sent away from here. We never see

here the quality of this variety that the Californian enjoys. This ought not to be so. What is pronounced by the majority of people as our best banana, the apple variety, is little known. It is small but has a very pleasant and decided flavor. Though it grows very easily, it is seldom found in the market.

In passing I would like to draw a comparison between Hawaii and the Island of Jamaica. One has but to read the history of Jamaica to see that, if it were not for the banana industry, that island would have practically no exports. Through the efforts of one man, this island has become foremost in the line of banana exportation.

One of our finest fruits and yet one that is hardly known is the wi. It grows easily, though a little difficult to start, it being necessary to crack the hard shell of the seed before planting. The fruit falls easily from the tree in a wind, even before maturing, so that it needs a breakwind. But when started and protected will yield as great a quantity of fruit as the mango does.

There is nothing more pleasing to my taste than half of a good, iced grapefruit, well sprinkled with sugar and served as an appetizer before dinner. It is well known by those who have had the opportunity of eating them that the Hawaiian grapefruit far excels any of the varieties imported. Our grapefruit is about the size of that grown in California, but is much more juicy and finer in flavor, and is almost never seen in the markets.

One very well known fruit is the lime. Enough has been done with this in the line of growing and importing from the other islands to supply the local market. This fruit is of good quality though small.

The lemon, which can be grown well in these islands, is not often seen.

As yet we have not been able to compete with California in the line of raising grapes. It is well known that one or two varieties do splendidly here, but unfortunately those who grow them pick them green and that naturally makes them sour. But when these grapes are allowed to fully mature, they turn out to be delicious, equal to those raised in the States. The Federal Government, seeing the possibilities of this industry, has decided to experiment with about 250 varieties to determine the ones best adapted to the Hawaiian conditions and climate.

Perhaps of all the fruits, the fig is the most easily obtained.

We, no doubt, have a superior fig for the table than the California variety, which though sweeter and so better adapted for drying, is much smaller and less juicy.

Not many berries have been tried to any extent in this country. During the season strawberries are quite plentiful and sold at a fair price. The mulberry is never sold, but is being cultivated to some extent by private individuals. The blackberry also is never seen in the markets but grows well at high elevations as has been proven by the patch Mr. Baldwin set out on Haleakala. A successful experiment has lately been made by Mr. Allan Herbet in grafting a cultivated variety of blackberry on the hardy wild native variety. A good sized blackberry of good flavor is the result.

During the hot summer months one of the fruits that greatly appeal to us is the watermelon. Considerable has been done with this fruit, which shows that with care and patience and under proper conditions this will grow to be of large size and delicious flavor.

The muskmelon seems to have quite a struggle to hold its own, but under the proper conditions this also can be made to grow well.

One of the fruits which is scarcely ever seen is the breadfruit. To my mind there are few things that surpass it when attention has been paid to the proper time for cooking.

The commonest wild fruit which is found along many of the roadsides is the guava. When one considers the flavor of this fruit and the possibilities of eliminating the vast number of seeds within it, we find that we have one more worthy fruit belonging to the tropical family. Among the varieties of this fruit, little known, but worth attention, is what is called the strawberry guava. It is small and red and has a most delicate and pleasing flavor.

The most successful fruit industry that we have is the pineapple. Because it has been given so much attention, it is one fruit we can buy to good advantage. It has been studied and many varieties tested and cultivated till we have a pine as superior to the native pine as one could imagine. Every one here knows that we can lead the world in growing this fruit. If as much attention, thought and capital were invested in some of our other fruits no doubt we could win a high reputation abroad for our superior oranges, mangoes, alligator pears, breadfruit, etc.

Some of the rarer fruits such as the watermelons, custard apple, loquat, soursop, ohelo berry, grenadilla and others could be grown to good advantage.

The fruits I have enumerated are all well, or fairly well known. There are many more that have been experimented with and proven a success, for instance, the mangosteen, the durian and the roselle.

Gradually I believe the thought of my paper will be achieved as it is very slowly being achieved. As with the pineapple so also with many of our fruits, one would not need to depend entirely upon shipping the ripe fruits as they are for profit, but many of them could be made into delicious preserves, jams, jellies, etc. Of late years papaya orchards have been started and one can purchase that fruit at any time in the market but, as is the trouble with most of the fruits, they are picked too green and allowed to ripen in the market. This destroys their delicate flavor and instead of tourists discovering what delicious fruits we have here they wonder anyone can enjoy them.

Already the mango is being made into chutney for export, the papaya and Chinese orange into marmalade for local use, and the guava into jams and jelly. This is a beginning but it should grow till we can all invariably enjoy food fruits on our tables and plenty of them and also until they are made to give many in this country a good living by the sale of these put up in many tempting ways.

Could not the settlers who have land on the higher elevations help out Hawaii as well as themselves by giving some of their attention to this problem? Most fruits no doubt would do better in their cooler and more moist atmosphere than they do on the low lands. Of course the subject will need much thought and many experiments would need to be tried, though many have already been tried at Wahiawa and other places, so that it might be a number of years before this would be accomplished. But, as has been proven by other fruits, much can be done and when it is done, Hawaii will be a better land to live in.

After all this is accomplished, one more point, which to my mind is very important and which in fact could be done now to much profit, is to make both*malihini and kamaaina thoroughly familiar with the way to prepare and eat our fruits in order to

*NOTE: 'new-comer' and 'resident.'

most enjoy them. Take for instance the mango and the wi—if you insert a flat handled nutpick into the stem end of these fruits so that you have a convenient way of handling them you no longer wish you were in a bathtub while eating them. To those not accustomed to the alligator pear, when it is eaten with salt only it is very distasteful, but prepared with vinegar, pepper and salt becomes palatable. The breadfruit, if eaten to advantage, must be allowed to so thoroughly ripen that when handled its sides will dent. And so on with nearly all our fruits. There are good and bad ways of preparing them, all of which each housekeeper and hotel and restaurant manager should know.

By means of a booklet, (similar to this one I have on Jamaica, which I consider very excellent), all this knowledge could be easily brought before the people to the very great advantage of Hawaii and Hawaii's visitors.

SELECTION OF SEED: COCO-NUTS.

The copra produced by 1,000 Ceylon ordinary nuts is about twice as much as that obtained from Seychelles nuts. This result has been obtained in the same soil, under the influence of the same climate, and is entirely due to selection. It is to be hoped that the discussion raised on the subject by the planters after their having seen the nuts introduced from Ceylon may prove the beginning of a careful selection of nuts for planting in Seychelles. Many of them have already informed me that they have found on their estates a few of their trees producing nuts similar to those of Ceylon and that they intend keeping them for propagation. It is probable that the trees which produce very small nuts have less requirements than those which produce bigger nuts, and that varieties which produce big nuts normally will bear smaller nuts if they are starved out. But when one thinks of the very trifling amount of plant food which is removed from the soil by coco-nut cultivation, there seems to be no difficulty in supplying the elements which are required to a greater extent by the big-nut varieties. The planter must choose between having small nuts without trouble and having double the crop by using proper methods and selection.—*Annual Colonial Report, 1904, Seychelles.*

KAU FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on June 20th, the reports of the Committee on Forestry and of the Superintendent of Forestry on the proposed Kau Forest Reserve on Hawaii, were approved, and a resolution in regard thereto adopted. Following the usage of the Board the resolution and reports are published herewith.

RESOLUTION IN REGARD TO THE PROPOSED KAU FOREST RESERVE.

Resolved, That all those certain lands in the District of Kau, Island of Hawaii, bounded in general terms as follows:

Lying on the lower southern slope of Mauna Loa, bounded on the west and north by the land of Kahuku, on the east by the forest fence erected within the land of Kapapala by the Hawaiian Agricultural Company, and on the south by a line drawn across the various lands back of Pahala and Hutchinson plantations, at approximately the lower edge of the existing forest, and containing an approximate area of 75,000 acres, as recommended by a report of the Committee on Forestry, dated June 6, 1906, based on a report of the Superintendent of Forestry, dated March 31, 1906, both of which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map and description made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map No. 2361," a copy of which said map and description are now on file in the office of this Board and made a part thereof, be approved as a forest reserve, to be called the Kau Forest Reserve.

Resolved, That the Board recommend to the Governor that the government lands lying within the boundaries of the said proposed Kau Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Kau Forest Reserve.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., June 6, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—Your Committee on Forestry have had under consideration the report of Ralph S. Hosmer, Superintendent of Forestry, dated March 31, 1906, recommending the establishment of a forest reserve in the District of Kau. After giving the matter careful consideration your Committee approve of the recommendation of the said report and recommend that the Governor be requested to declare the area therein recommended to be a forest reserve, and to set apart the government lands lying within the boundaries of such proposed reserve, which are available for such purpose, as a forest reservation.

Your Committee note with pleasure and commendation the public and enlightened spirit in which the Hawaiian Agricultural Company and the Hutchinson Plantation Company have treated the forest question in this district. The great bulk of the lands involved in this proposed reservation are under long term leases to the two corporations in question, which leases are about to expire, with no assurance that the present lessees will again secure the lands. Notwithstanding this fact and that they were paying rent on the land in forest, the two corporations in question have fenced out large forest areas from stock and have largely developed the water supply on the same, by means of tunnels and ditches and have built lengthy and expensive fences for the sole and express purpose of preserving the forest.

The Hutchinson Company has built 17 miles of fence and the Hawaiian Agricultural Company 35 miles of fence in this connection, at their own expense and without cost to the government. As a result of this wise policy the forest enclosed has not only held its own but has recovered and reforested a large area which had become more or less damaged by cattle; while a large amount of water has been developed where practically no water available for economical purposes previously existed.

If the same enlightened policy were pursued throughout the

Territory it would greatly simplify the forest problem and redound to the public benefit.

Your Committee herewith present a resolution for the purpose of carrying this recommendation into effect.

We remain,

Your obedient servants,

L. A. THURSTON,
ALFRED W. CARTER,
W. M. GIFFARD.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

March 31, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I beg to submit the following report, with recommendations, upon the proposed Kau Forest Reserve, in the District of Kau, Island of Hawaii. This report is based upon field work done by me during visits to Kau made in February, 1904, and August, 1905, supplemented by other information obtained between and since those visits. The report deals with the forest problems that are presented in the part of Kau covered by the proposed forest reserve. It will be followed by a supplementary report containing a technical description of the reserve boundary line herein proposed. As soon as this description is in hand, I recommend that the Board pass a resolution favoring the reserve, that the matter may take the usual course.

LOCATION AND AREA.

The area covered by the proposed Kau Forest Reserve may be roughly described as that portion of the District of Kau, lying on the lower southern slope of Mauna Loa, bounded on the west and north by the land of Kahuku, on the east by the forest fence erected within the lands of Kapapala by the Hawaiian Agricultural Company, and on the south by a line, fenced in part, drawn across the various lands back of the Pahala and Hutchinson plantations at approximately the lower edge of the existing forest. The gross area of the Kau Forest Reserve is approximately

75,500 acres, of which all but a small percentage is government land.

OBJECT.

The object of the Kau Forest Reserve is to insure the continued protection of the forest on the lower slopes of Mauna Loa, because of its importance in maintaining the favorable conditions on which the water supply of the agricultural lands in the Kau District depends.

DESCRIPTION OF THE TRACT.

At present the government land within the boundaries of the proposed Kau Forest Reserve is for the most part under lease either to the Hawaiian Agricultural Company or to the Hutchinson Sugar Plantation Company. Many of the leases are about to expire and of the remainder of the government land there are some forest tracts that are not now under lease.

The important leases that have some time yet to run are for the land of Waiohinu and the Puumakaa-Kiolakaa Forest Tract, both leased to the Hutchinson Sugar Plantation Company, the leases running respectively until April 1, 1914, and May 24, 1923. These lands adjoin one another and form the western end of the proposed forest reserve. Toward the eastern end, the lease on the tract known as the Kaalaala-Makakupu Forest, to the Hawaiian Agricultural Company, runs until July 1, 1924. Under the old classification the land of Waiohinu was a "crown land," all the rest of the government tracts within the reserve were "government lands."

FENCES.

Most of the existing leases contain clauses requiring the protection of the forest. That for the Puumakaa-Kiolakaa Forest Tract, made in 1902, requires that a fence be built and maintained around three sides of the tract and in lieu of the fourth side, along the Kahuku boundary until it meets the forest fence built and maintained by the Hawaiian Agricultural Company. The Puumakaa-Kiolakaa fence, around the western end of the reserve, was begun about three years ago by the Hon. George C. Hewitt, then manager of the Hutchinson plantation, and was completed during the summer of 1905 by Mr. Carl Wolters, the present manager. It is approximately 17 miles in length.

The entire eastern part of the proposed reserve, containing about half of the total area, was voluntarily set apart and has been treated as a private forest reserve for the last ten years by the Hawaiian Agricultural Company, the lessees of the government forest lands. At the suggestion of Mr. George H. Robertson, manager of C. Brewer & Company, a forest fence was built extending from Puu Enuhe, on the western boundary of the Bishop Estate land of Punaluu, up through the forest to the boundary of Kahuku, thence following the Kahuku line to the eastward, although not always on the exact boundary, to the land of Kapapala; thence out into Kapapala between two and three miles and makai to a point near the lower edge of the forest, nearly straight northwest from the "Half Way House," thence along, but a little within, the lower edge of the forest to a point near the Kapapala boundary where it connects with the cane field fences of the Pahala Plantation, which extend to the initial point. The fence was begun in August, 1894, and completed in February, 1896. The length of the fence as originally constructed was 35 miles; the total cost of construction was \$12,000, which figure does not include the cost of repairs made a few years ago, nor the amount now annually expended for regular maintenance.

As first built the fence on Kapapala was about a mile to the eastward of its present location, a portion of the reserved area having been cut out as a paddock some five years ago by the erection of a new fence up and down the mountain. This makes the present eastern boundary of the reserve. This fence is the one above described as cornering at a point back of the "Half Way House."

With the completion in 1905 of the fence built by the Hutchinson Sugar Plantation Company, along the Kahuku boundary to meet the Hawaiian Agricultural Company's fence, the necessity for the fence running up the mountain through the forest from Puu Enuhe ceased. The wire was accordingly removed and this stretch of fence discontinued. The total length of forest fence now maintained by the Hawaiian Agricultural Company is therefore about twenty-six miles.

The credit of carrying the plan into operation and of building this forest fence belongs to Mr. Julian Monsarrat, manager of the Ranch Department of the Hawaiian Agricultural Company, to whom has also been entrusted the care of the reserve

since the fence was built. Following the completion of the fence, systematic driving and shooting got the wild cattle out of the forest and since that time no cattle have been allowed in the reserve.

The makai or south side of the proposed reserve adjoins the cane fields most of the way and is accordingly protected from cattle by the cane field fences or by natural barriers. In other situations short stretches of existing or proposed fence do or will complete the line.

WATER SUPPLY.

By reason of the protection afforded by its private forest reserve the Hawaiian Agricultural Company has by an extensive system of tunnels, ditches and flumes, been able to develop a reliable water supply, sufficient to meet the requirements of a large sugar plantation. Were it not for the water obtained from the forest and which depends for its continuance on the forest cover being permanently maintained on the mountain side, much of the agricultural land now under a high state of cultivation could only be used for grazing.

There is no question but that the Pahala Plantation has reaped the chief benefit from the development of the water supply which the reservation of the forest has made reliable, but it seems to me that the fact that such a development of natural resources would not have taken place save for the plantation, ought to be taken into account by the government and put to the credit of this company.

The indirect benefits which result to the Territory from the maintenance of such a forest reserve as this in Kau are sometimes lost sight of in the immediate gain enjoyed by the plantation, but it should not be forgotten that an increase in the acreage of cane land results in larger returns to the Territory, not only through direct taxation on the land itself and the crops grown thereon, but also through the increase of the minor and tributary business interests which depend for their existence on the success of the plantations. These industries, whether located in the neighborhood of the plantation or elsewhere in the Territory, yield in turn an increasing revenue through taxation as well as, and what is more important, going to make up the general prosperity of the Territory.

The same thing applies to what has been done in the development of water on the government lands back of Naalehu by the

Hutchinson Sugar Plantation Company, with the difference in this case that until recently the protection of the forest has not been carried out in so systematic a way on these lands as above Pahala.

If it is legally possible, it seems to me only just that these facts be considered in future dealings which the government may have with these companies.

While much has already been done toward developing water in Kau it would without doubt be possible to obtain some additional supplies by running flumes further back into the forest and by more tunnels. Just how much it is advisable to do can, of course, only be told after a careful study of the whole situation by competent persons. In the case of the Hutchinson Sugar Plantation Company, the most promising outlook seems to be on the fee simple lands of Hilea, but as this matter is outside the province of this report it need not be further discussed here.

GRAZING.

There is no grazing proposition in connection with the Kau Forest Reserve. Owing to the fact that it is possible to profitably cultivate cane at a higher elevation than on the windward side of the island, the forest line is much of the way identical with the upper edge of the cane fields, thus leaving no intervening stretch of open grazing land as is usual elsewhere in the Territory. Outside of the ranch departments maintained by the two large plantations there are no cattle interests in the section of Kau adjoining the proposed forest reserve, except the Kahuku Ranch. And as the entire boundary line between Kahuku and the Kau Forest Reserve is already fenced this ranch need not be here considered.

The ranch department on each plantation is subordinate to the main industry, and the cattle of each are for the most part confined to lands outside of the forest, not suitable for raising cane.

ELEVATIONS.

The highest profitable limit for raising sugar cane has been found to be about 2300 feet back of Naalehu. Above Pahala the line of flume laid out by Mr. J. S. Emerson in 1903 is considered the permanent upper limit of the cane fields, although not

all of the land below this line has as yet been brought under cultivation. This elevation is approximately 3000 feet.

Both at Naalehu and Pahala the upper land has been cultivated on contract by Japanese. As the crop at this elevation takes longer to mature the tendency is to pay more attention to intensive methods on the better lands below, rather than to take in a larger area above. Especially is this statement true of Naalehu, where all the available water that can be got is wanted for the irrigation of the lower level fields.

FUEL SUPPLY.

Special mention should be made of one area above Pahala, the so-called Mud Flow on the eastern side of "Wood Valley" on the government land of Ahulili, which I recommend be included in the reserve. The Mud Flow is a rough, rocky point projecting into the cane fields, the lower end of the area covered by a land slip. While the great bulk of the Kau Forest Reserve is to be considered as essentially a protection forest, such areas, being in a sense detached from the main forest and consequently exercising less influence on the drainage, could well be devoted to growing trees to supply the demand for timber and fuel always existing on the plantation below. This use of the land, under suitable restrictions and proper management, would in no way conflict with the main purpose of the reserve. It would rather be directly in line with the idea of the "preservation of the forest by wise use" that underlies the whole forest reserve system.

THE FOREST.

The forest in the proposed Kau Forest Reserve is largely made up of Koa and Ohia Lehua growing together, or forming pure stands, or in mixture with other less important trees. On the lower or makai side of the reserve, up to an elevation of perhaps 4000 feet, are found a number of trees in mixture with those just mentioned, none however being of commercial importance. Above this is a belt of Koa: a nearly if not quite pure stand of large sized trees. On the upper or mauka side of the reserve the Koa gradually gives place to Ohia Lehua, which in places forms a pure stand, for the most part of rather young trees. Koa and Mamani are found in detached groves further up the mountain on Kahuku in *kipukas* or pockets of good soil in the lava.

In the lower section of the reserve is a dense undergrowth. Perhaps nowhere in the Territory is there a finer example of the fern jungle, with its dense mass of tree and other high-growing species rising above a forest floor covered with the lower growing types and with bracken, than in the forest of Kapapala. Climbing vines like the *Ie-ie* are also in evidence, although the characteristic belt for this species is at a lower elevation.

Since the forest fence was completed ten years ago a wonderful difference has been noticed in the appearance of the forest. Even in the eighteen months elapsing between my two visits to Kapapala the growth of young trees had been sufficient to make impassable on horseback trails over which we rode in 1904. All around the outer edge of the reserve there is excellent reproduction, especially of *Ohia Lehua*, as well as, of course, a great increase in ferns and other undergrowth. A detailed examination of the reserve would yield much information of the greatest interest. In this report the description of the forest must be limited to this brief mention.

BOUNDARY.

The location of the boundary of the proposed Kau Forest Reserve was decided on after consultation on the ground with representatives of the two plantations and as fixed meets with the approval of those controlling the two companies. The boundary on the north and west sides is the natural one, as it is the dividing line between the government holdings and the large privately owned land of Kahuku, the greater part of which is without a forest cover. At the east end, while the forest actually extends somewhat further into Kapapala than the area now inclosed by the forest reserve boundary fence, it is believed that enough of the forest has been included to secure the objects for which this reserve is made. The section of Kapapala between the present reserve boundary fence and a line drawn northwest from Ainapo is good grazing land and all things considered I believe it should be so used.

The location of the lower line of the reserve has been the subject of special study on my part and as finally fixed I think it meets practically all of the requirements. Everywhere the line has been drawn with special reference to excluding from the reserve land suitable for agriculture. It is believed that this

has been successfully done, for under the existing economic conditions in Kau, including the lack of markets and the difficulty in transportation, it is not profitable to go further mauka than the present limit of cultivation.

Wherever possible advantage has been taken of natural boundaries, of existing fences, or of other limits already on the ground. Certain prominent points along the line have been marked with the sections of galvanized iron pipe constituting the lower part of forest reserve monuments, so that the upper sections of the monuments can now be put in place at any time. At other points on the line it may be well later to erect other and more conspicuous monuments, such as fern and rock ahus, but these details need not be discussed here.

DESCRIPTION.

A brief and popular description of the proposed boundary of the Kau Forest Reserve is as follows:

Starting on the Kahuku boundary at the northwest corner of the Puumakaa-Kiolakaa Homesteads and running along the mauka line of said homestead tract (already fenced) to the Waiohinu Springs; thence across the lands of Kahilipali 2, Kaunamano and Kioloku above the present (1906) mauka boundary of the cane fields to the northwest corner of Honuapo; thence across the lands of Hionaa, Hokukano, Kaalaiki and Hilea, to a point on the mauka side of Pakua Hill; thence to and following the upper line of the Ninole Homesteads across to a point on the Puu Enuhe Ridge; thence across the lands of Punaluu, Mohokea and Moaula above the cane fields to a point on the makai face of Puu Kaumaikiohu; thence to and following the flume line laid out by Mr. J. S. Emerson in 1903, to Kahaha Triangulation Station; thence to and around the cane fields at the head of the so-called Wood Valley; thence around and including the so-called Mud Flow on the eastern side of said valley; thence following the fences making the mauka line of the cane fields, and the Kapapala forest reserve fence to the point where it turns mauka back of and northwest from the Half Way House; thence following the Kapapala forest reserve fence mauka and to the westward to the southeast corner of Kahuku; thence in a general southwesterly and southerly direction along the Kahuku boundary to the initial point.

The gross area of the proposed Kau Forest Reserve as above outlined is approximately 75,500 acres.

LANDS INCLUDED.

The lands within the limits of the proposed Kau Forest Reserve which can, as a whole or in part, be set apart at this time as portions of the reserve are, in part, as follows:

(a) The lands now covered by Territorial Land Office Leases:

No.	Name.	Lessee.	Expiration.
106	Kapapala	Hawaiian Agricultural Co. . .	July 1, 1907
297	Moaula - Kopu-		
	Makaka (Ma-		
	uka)	do	... June 15, 1906
454	Mohokea 1 & 2.	do	... June 4, 1907
429	Ninole - Wailua		
	Forest	Hutchinson S. Plant. Co. . .	June 17, 1906
299	Kaalaiki	do	... Sept. 8, 1906

(b) The following unleased government lands, as a whole or in part:

	No.	Lease
	Lease.	expired.
Kaauhuhuula Forest		
Kaalaiki (mauka)		
Kioloku		
Kawala - Kaunamano.	420	Oct. 22, 1905
Hionaa - Kokukano.	421	Jan. 10, 1906

There may be, probably are, other government lands not now under lease within the limits of the reserve, but the above list includes all the larger lands. In this connection reference may again be made to the other large government lands within the reserve on which the leases have yet many years to run: Puumakaa-Kiolakaa Forest, Lease No. 550, expires May 24, 1923; Waiohinu, Lease No. 151, April 1, 1914, and Kaalaala Makakupu Forest, Lease No. 555, July 1, 1924.

The more important privately owned lands within the Kau Forest Reserve are portions of Kahilipali 2, Hilea 1 (Hutchinson Sugar Plantation Company), Hilea 2 (Hutchinson Sugar Plantation Company in part), Punaluu and Paauau 2 (Bishop Estate), and Keaiwa.

On all of these lands it is the policy of the owner to protect the forest and carry out provisions looking to the maintenance of the area as a forest reserve.

RECOMMENDATIONS.

For the reasons above set forth, I therefore recommend that the Board adopt a resolution requesting the Acting Governor (1) to declare as the Kau Forest Reserve the area described above, and (2) to set apart as portions thereof all of the government lands lying within the said boundary, which are not now under lease or on which the existing leases are within two years of expiration.

I further recommend that whenever new leases are made, either for the lands adjoining the reserve or for the rights to prospect for and develop water within the reserve itself, clauses be inserted providing that the existing forest reserve boundary fences be maintained in good condition; and, whenever and wherever it may become necessary in the future to better protect the forest in localities not now fenced, that the lessee be required to build and maintain fences along such portions of the forest line.

If the lands continue to be used as at present such fencing will, except perhaps in a few cases, be unnecessary. A case in point is the section above Pahala where the line of the Emerson flume is taken as the boundary of the reserve. It is expected that this line will serve without needing to be fenced, but if in the future it should appear that the forest above is receding or being injured through lack of protection, the clause suggested would remedy the difficulty.

I would again call attention here to the suggestion made above that if it is possible under the law, some recognition should in my judgment be taken of the work done by the plantation interests in Kau in developing a water supply on government land, whereby it has been possible to bring considerable additional areas under a high state of cultivation, with corresponding financial returns.

ACKNOWLEDGMENTS.

In closing this report I wish to express my appreciation of the courtesies extended to me during my visits to Kau by Messrs. C. Wolters and Julian Monsarrat. To both these gentlemen, particularly to Mr. Monsarrat, I am indebted for assistance en-

abling me to get in touch with the local conditions as well as for valuable suggestions in regard thereto. I am also under obligations for information concerning Kau to the Hon. George C. Hewitt of Waiohinu, to Mr. John C. Searle of Hilo, and to Messrs. George H. Robertson and W. M. Giffard of Honolulu.

DESCRIPTION.

[The technical description of the boundary of the Kau Forest Reserve, prepared by Mr. George F. Wright of the Government Survey, is here omitted, as it is somewhat lengthy and will be published later in this magazine as a part of the proclamation creating the reserve.]

A public hearing to consider the setting apart of the Kau Forest Reserve has been called by Governor Carter for August 1, 1906, at the office of the Board of Agriculture and Forestry, in Honolulu.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry

PLANT DISEASES.

Southern California is to have a laboratory and experiment station for the study of diseases of plants. The financial support is to be furnished by the State that the work may be undertaken by the University of California as a part of the activities of its Department of Agriculture. The State Commission for the selection of a location for a pathological laboratory and experiment station—a board consisting of the Governor, President Benjamin Ide Wheeler, of the University, and Professor E. J. Wickson, of the chair of agricultural practice in the University, is ready to receive proposals in regard to a site.

A DUTY.

By WILLIAM DUTCHER, President National Association of Audubon Societies. Office, 141 Broadway, New York.

And Let Fowl Multiply on the Earth.

Scarcely more than a generation ago the buffalo ranged the Western plains in countless herds, their numbers so great that no written estimate can be considered an exaggeration. Those who were fortunate enough to see one of these great hosts surging over the prairies little thought that in a few short years the buffalo would simply be a part of history. This noble beast was exterminated by man with a butchery so ignoble that it is sickening to dwell upon. The few dollars received for the hide was the incentive for this national disgrace. Almost at the same hour that the buffalo were vanishing, another of the wonders of this continent was also being ruthlessly and recklessly destroyed. Early writers tell of flocks of wild pigeons so large that the account of their numbers verges on the fabulous. Where are these countless winged hosts today? All gone. Why? Simply that a limited number of men without thought for the future might gather a few dollars by sacrificing millions upon millions of harmless and beautiful forms.

These two great assets of the people, of use and beauty, were improvidently wasted, because no public-spirited persons or association had the foresight or interest to protect them from the small band of selfish men who were the destroyers. The passing of the buffalo and wild pigeons is a forceful commentary on the indifference of the people of those days. Are the people of this generation showing any greater degree of interest in the wild life of the present day, much of which is rapidly decreasing in numbers? Few people realize how near the gulls and terns of our coasts came to extinction during the last decade, when fashion decreed that the snow-white plumage of those beautiful denizens of the beaches was necessary for millinery ornaments.

A simple proposition, in fact a duty, is now before the American people: Shall the sea-birds be preserved for future generations? Unfortunately, this class of birds gather in colonies during the breeding season, and are thus in greater danger than the wild bird that breeds singly. Plume-hunters can still kill them as in the past, when large colonies on our sea-board were destroyed

in a single season. Another method of extermination is egging; this is quite as fatal as killing the birds. There are yet small colonies of sea-birds which will serve as a nucleus, and may, by the greatest care and watchfulness, repopulate our country with these birds. If this desirable result is to be achieved, action must be taken at once by the public; it will not do to neglect the matter another season, or our children will say of us what we now say of our fathers regarding the buffalo and wild pigeon: "When you had the opportunity to save the sea-birds you did not do it, and we are deprived of a part of our heritage." The sea-birds can only be saved by placing at each colony, during the breeding season, an energetic, faithful and fearless warden, who will stand guard during the three months when the birds are brooding their eggs. The part the public can take in this great economic and esthetic movement is to supply the necessary funds. The National Association of Audubon Societies, an incorporated body, will do the administrative work.

During the present breeding season this Association has forty such wardens employed, but this number should be increased to at least three hundred men, in order to fully guard all of the remnants of colonies that once existed. The public are urged to join the National Association, the membership fee being five dollars a year, all of which sum is used in bird-protection work, as the executive officers of the Society contribute their services without compensation.

The seashore without the sea-birds would be like a garden without flowers or a landscape without trees. Unless active measures are taken now to prevent this disaster, it will surely come; then, reader, it will be too late to do more than grieve. This is not a duty you can delegate to your neighbor; it belongs to you. Will you help save the sea-birds, or will you see them vanish? To your descendants you are responsible.

*BY AUTHORITY NOTICES.**SPECIAL WARNING NOTICE.*

FIRES TO CLEAR LAND—EWA BASIN, OAHU.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has been first obtained, for all that portion of the District of Ewa, Island of Oahu, lying above the mauka boundaries of the cane fields of the Honolulu, Oahu and Ewa Sugar Plantations; and for that portion of the District of Waianae, Island of Oahu, lying between the Government Road from Pearl City to Waialua and the ridge of the Waianae Mountains.

The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. W. F. Dillingham of Honolulu.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, March 17, 1906.

APPOINTMENT OF DISTRICT FIRE WARDENS.

Notice is hereby given that the following named gentlemen have been appointed Fire Wardens, under the provisions of Act 71 of the Session Laws of 1905, as follows:

DISTRICT FIRE WARDENS.

Mr. Hugo Haneberg, in and for the District of Kipahulu, Island of Maui.

Mr. Fred Meyer, in and for that portion of the District of Waianae, Island of Oahu, lying to the west of the summit ridge of the Waianae Hills.

Mr. H. J. Rhodes, in and for that portion of the Palolo Valley, District of Kona, Island of Oahu, lying mauka of the Waialae Road.

DEPUTY FIRE WARDEN.

Mr. David Haughs, Deputy Fire Warden at Large for the Territory of Hawaii.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, March 23, 1906.

SPECIAL WARNING NOTICE.

FIRES TO CLEAR LAND—WAIANAEE VALLEY, OAHU.

Notice is hereby given that in accordance with Section VI of Act 71 of the Sessions Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has been first obtained, for that portion of the land of Waianae-kai, District of Waianae, Island of Oahu, lying above and mauka of the cane fields of the Waianae Plantation Company.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. Fred. Meyer of Waianae.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, March 23, 1906.

Notice is hereby given that Dr. J. Charlton Fitzgerald has been appointed Assistant Territorial Veterinarian for the Territory of Hawaii, under the Board of Agriculture and Forestry, according to the provisions of Act 82 of the Session Laws of 1905.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., April 2, 1906.

ACTING CHIEF FIRE WARDEN.

Notice is hereby given that during my temporary absence from the Territory, Mr. David Haughs, of the Division of Forestry, will be Acting Chief Fire Warden, with all the rights and powers appertaining to that position.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., April 7, 1906.

Notice is hereby given that permits for burning brush during the period of special fire danger, running six months from March 7, 1906, on the land of Wahiawa, District of Waialua, must now be obtained from Mr. Byron O. Clark, instead of Mr. A. M. Nowell.

DAVID HAUGHS,

Acting Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., April 16, 1906.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF KONA, ISLAND OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of Government land on the western slope of Mt. Huaialai, on the Island of Hawaii, bounded on the South by the land of Puaa 1, on the West and North by the portion of Honuaula now covered by Lease No. 570 of the Territorial Land Office, and on the East by a line drawn from Puu Lae Koa to a point on the Puaa boundary a little below Puu Laalaau, in the District of Kona, Island of Hawaii, Territory of Hawaii; more particularly described as follows, viz:

Beginning at the Southeast corner of this Reserve, marked by a 3" pipe with a target on Top, marked F. R. T. H., and large ahu, on the boundary of Puaa 1 and Honuaula, true azimuth and distance from Government Trig. Station Puu Laalaau being $61^{\circ} 32' 17''$ distance 960.3 feet as shown on Government Survey Registered Map No. 1972 and running by true azimuths:

1. $61^{\circ} 32' 17''$ 4319.7 feet along land Puaa 1 to a 3" pipe and target marked F. R. T. H.;
2. $137^{\circ} 22' 15''$ 6871.9 feet along makai portion of Honuaula to a 3" pipe and target marked F. R. T. H.;
3. $223^{\circ} 00' 00''$ 3549.0 feet along remainder of Honuaula to + on stone, pipe with target marked F. R. T. H., and large ahu;
4. $312^{\circ} 50' 30''$ 8225.4 feet across mauka portion of Honuaula to the initial point. Area 665.0 Acres.

And I do hereby set apart as the Honuaula Forest Reserve that portion of the government land of Honuaula within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 4th day of April, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

Notice is hereby given that MR. WILLIAM G. OGG has been appointed District Fire Warden, in and for that portion of the District of Kau, Island of Hawaii, extending from the Puna District Line to and including the land of Punaluu, under the provisions of Act 71 of the Session Laws of 1905.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.
Honolulu, T. H., June 30th, 1906.

Notice is hereby given that MR. W. C. WEEDON has been appointed District Forester, in and for that portion of the District of Koolaupoko, extending from and including Heeia to the land of Kailua, Island of Oahu, under the provisions of Act 44 of the Sessions Laws of 1903.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., June 30, 1906.

Notice is hereby given that MR. GEORGE CAMPBELL has been appointed District Fire Warden in and for that portion of the District of Koolaupoko, extending from and including Heeia to the land of Kailua, Island of Oahu, under the provisions of Act 71 of the Sessions Laws of 1905.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., June 30, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

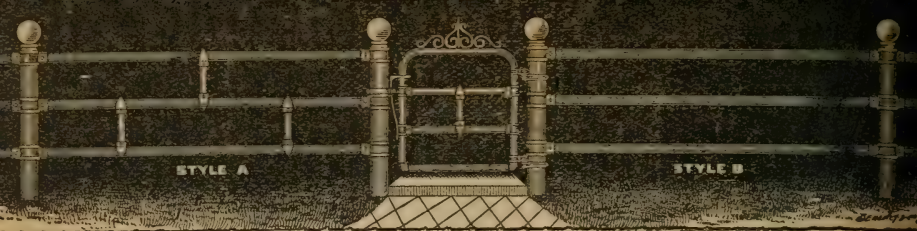
"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

AUGUST, 1906

No. 8

One of the most important steps in the establishment of an Hawaiian export trade has recently taken place upon the coast. The newly incorporated Pacific Distributing Company of San Francisco has been founded for the exclusive handling of our island products, and being the first organization that has directed itself to this object its inception is worthy of more than passing interest. The new company will devote itself to the distribution upon the coast of Hawaiian sisal, coffee, pineapples, bananas and all other products except sugar. It will also incidentally foster a demand for such less known fruits as the mango and avocado pear by making their qualities more widely known among mainland consumers.

The new company commences its career under most favorable auspices, its vice-president being Mr. Wallace Alexander, the San Francisco manager of Messrs. Alexander and Baldwin, and its manager, Mr. Paxon Wright, the former San Francisco buyer for the Honolulu Company. Its headquarters are at 308 California street, San Francisco, and the company has already established connection throughout the West and is gradually extending its sphere towards the Atlantic coast. By this means the company will be able to acquaint itself of the local demand at each center and will thus be in a position to consign shipments with expedition to the points of most advantage. Hitherto one of the most frequent sources of loss to Hawaiian growers has been due to their inability, consequent upon the remoteness of their market, to direct their product to the point of greatest demand. The new company will be able to exactly gauge the requirement of each city, and will, in consequence, be able to apportion island products in such a way that good fruit will always realize good prices. It is expected that each sub-agent will notify the company of the requirements of his locality and will forward orders to be filled at the central office. If Hawaiian shippers and growers will also keep the company informed of their prospective consignments, expeditious and profitable sales will be

effected. It is to be hoped that the new company will meet with cordial coöperation on the part of Hawaiian growers, as by its means the possibilities of development of many of our industries will be greatly increased. With proper care Hawaii should become a great fruit-producing country and may in time be sending a regular supply of choice fruit to every city of importance in the Union. Already our pineapples are becoming well known and in a few seasons their superior qualities will create a demand for them which will be difficult to supply. With this should come prices to make the industry one of the most lucrative in the islands. Hawaiian bananas will in the same manner extend their sphere of demand throughout the whole of the Western States to the exclusion of the foreign fruit. Hawaiian mangoes and avocado pears, and many other fruits at present given little concern will follow in the wake, until the term "Hawaiian fruit" will be the standard of excellence. All this, however, cannot be achieved without well organized and persistent effort, but if the Pacific Distributing Company is alive to its opportunity, and if the Hawaiian producers give it due support, the resources of our islands should ere long be taxed to meet the demand for their fruit.

Mr. Dickson is now in the islands representing the interests of the Pacific Distributing Company. He will endeavor to enlist the support of local producers and in this the Forester wishes him all success.

It is often asserted that a certain fruit is the "king" or "queen" of all others, but an effort to exactly determine the order of merit of different fruits appears to be futile, as the question very largely resolves itself into one of personal appreciation. A recent writer in "Rural World" elevates the pomelo to the high honor of "finest fruit of the Orient." A well known agricultural publication takes exception to this opinion in the following terms: "The mango is not only more delicious but more popular and more extensively grown. The mongosteen is still more delicious, but not adapted to so wide a territory as either the mango or the pomelo." While agreeing with the last writer as to the popularity and more extensive cultivation of the mango, his unqualified statement that the fruit is more delicious than the pomelo cannot be taken as of more weight than expressing individual taste.

Fortunately no fruit possesses such pre-eminent qualities as to outdistance all rivals, but each species is particularly appropriate to fulfil individual uses, and what qualities one is deficient in another supplies. Of salad fruits who shall say that the tomato excells the avocado pear? Or even could an exact discrimination between the two be made, many elements intervene, such as those of comparative cost of production, length of season, extent of habitat, and suitability for export which would go far to determine general popularity and utility irrespective of mere flavor and quality. And so with all fruits. For drying and export, figs, dates, prunes and grapes are suited, yet to none of these is preference accorded, or one only would be grown to the exclusion of the others. For preserves and jams, strawberries, currants, apricots and plums each have their particular use. For table use pineapples, grapes, oranges and apples, each in turn are welcomed. And so throughout the entire category, the luscious peach, the exquisite lichi, the humble poha and the plebian watermelon each in turn is king, in some season, for some use, or to some individual, until a throne is even dedicated to the repellant durian. Of this last fruit, of which it is said that when one has overcome one's natural loathing one becomes passionately fond, Richard Semon writes: "In passing the market on my arrival at Java, I had been struck by an odd and disagreeable smell, reminding me at the same time of musk or onion and evoking the idea of something rotten and about to decay. In the hotels it is forbidden to introduce Durian or to eat it indoors." Wallace, the great naturalist, devotes several pages in his *Malay Archipelago* to a classic description of this "king of fruit," whose flavor he compares to "a rich butter-like custard, highly flavored with almonds and intermingled with which come wafts of flavor that call to mind cream-cheese, onion-sauce, brown sherry and other incongruities. To eat Durian is a new sensation, worth a voyage to the East to experience." There is said to be only one productive Durian tree in the islands, on Kauai, but if the enthusiasm of Wallace were more generally shared there would certainly be more. However, after the description of the eminent naturalist's "king" of fruit, we turn with gratitude to the more humble varieties of our own islands.

Attention is called to the proclamation of the Kau Forest Reserve, in the District of Kau, Island of Hawaii, that appears as a By Authority Notice on another page of this issue of the Forester.

Protecting, as this reserve does, the large watershed which supplies the needs of two great sugar plantations, the Kau Forest Reserve is an important one. The total area included within the limits of the Kau Forest Reserve is 65,850 acres. Of this area 59,618 acres is government land, of which 23,630 is under lease for a considerable period. The remainder, 35,988 acres, was actually set apart under the law when Governor Carter signed the proclamation creating the reserve, on August 2nd, 1906.

The owners of the private land within the reserve boundaries are heartily in favor of the creation of the reserve and will continue to manage their lands with reference to the objects for which the reserve is created. This was plainly brought out at the public hearing by representatives of the adjoining plantations, as was also the fact that one of the main objects of the Board in creating the reserve was to insure the continuance of the water supply which these plantations have done so much to develop. The legitimate development and proper use of the water from forest reserves, under water right leases issued by the Commissioner of Public Lands, is indeed one of the things which the forest reserve policy is intended to foster.

It will be recalled that the reports of the Superintendent of Forestry and of the Committee on Forestry, with the resolution adopted by the Board in regard to the Kau Reserve, have already appeared in the Forester, these documents having been published in the July, 1906, issue.

Experiments have lately been conducted to determine the possibilities of growing trees in the sand hills of Nebraska with results which encourage the belief that certain species may be grown with success in that region. It would seem to be expedient to investigate in this direction in these islands with a view to rendering productive and gradually to bring into cultivation the arid and shifting sand wastes which occur in various parts of the islands. Among the many advantages which would accrue in the course of a few years would be the conservation of mois-

ture and a general lessening of the extremely harsh temperature and excessive sunlight in the regions alluded to, which would gradually render them suitable for settlement. With the production of humus from tree growth and proper irrigation, a soil could be developed which would compare well with any other on the islands.

Any readers possessing copies of Mr. F. E. Conter's paper on "Sisal," which constitutes No. 4 of the Bulletins of the Hawaii Experiment Station, will confer a favor by forwarding them to the Forester. At present the issue is out of print and requests for copies have lately been received.

LADYBIRD v. WOOLLY APHIS.

On the 27th inst. I made another inspection of Mr. Muir's, Forest Hill, Mount Barker, to see the result which has attended the introduction of the ladybirds (*Leis Conformis*) introduced from Tasmania and liberated last year on the apple trees infested with woolly aphid. This orchard is one of the old-established ones of the district, and as a number of the apple trees were not on blight-proof stocks the pest made great headway when once introduced, and has been to the owner a source of worry and expense to keep it any way within bounds. At present, so satisfactorily has been the work of the ladybirds, there are only a very few apple trees with any trace of the woolly aphid, and these seem to have been missed by the ladybirds, although numbers were placed on them while these friendly insects were plentiful. Mr. Muir informs me that he intends to thoroughly spray immediately all infested trees, and destroy all trees not of blight-proof stocks, and hopes by this means to eradicate the pest, which has been reduced to such a small matter by the predaceous insects.

Numbers of another kind of ladybird, the *Oreus Australasiae*, indigenous to this country, are present in the orchard, and are doing good work on the Greedy Scale, the soft Brown Scale, and the Black Scale, but no trace, so far, of the internal parasites lately liberated for the two latter could be discovered.—Inspector David L. Breen in the Journal of Agriculture, W. A.

NOTES ON VEGETATION IN HONOLULU.

In a recent issue of *Park and Cemetery*, Charles Mulford Robinson, the civic beautifier, writes as follows:

The Hawaiian Islands, called "the Paradise of the Pacific," are coming more and more into public thought as a goal, as a dreamed-of haven, where, in the happy Sometime, one may go to find rest and beauty. And those things are found there. No one comes back without testifying that the dream is true; and year by year the tide of travel rises, more persons journey to Hawaii, realize the dream, and return to awaken a keener interest in those tranquil little islands—the farthest from the main land of all the inhabited islands of the world—where the broad Pacific is a sapphire sea.

If one could go with his eyes closed from Chicago to the Golden Gate, there certainly would be no sense of disappointment in the first impression made by the vegetation of the Hawaiian Islands after six days of sailing on the ocean. But all the way across the ocean one's eyes are very much open, and going as I did by way of Southern California, with frequent stops of several days at a time—and always saying to one's self, "Those palms are fine, but wait for Honolulu; these flowers are lovely, but think of the tropical blooms that we shall see; and these green fields, and hillsides verdant beneath the warm rains and brilliant sun of the California winter, are well in their way; but one must be temperate in admiration since the tropics are yet to be seen"—if one could go to Honolulu with none of this experience, there could be no disappointment. But after the roses of California, after the riot of flowers in park and garden, by wayside and in wood and field, which California offers to the winter traveler, the first views of the Hawaiian Islands and of Honolulu are not quite all one hoped.

The northern side of the island of Oahu, which is the first land seen at close range, is bleak and bare. Rocks jut into the sea, extinct volcanoes raise bleak sides in a gaunt and naked sternness that the tints of softening distance scarcely hide; and when the end of the island has been rounded, and skirting the southern shore one comes into the harbor, the land is yet so far away that in the larger features of the scene—in the beauty of peak and crater and of shadowy valley, and in the interest of the structures of the city—one quite forgets to notice the

cocoanut palms, which in pictures give the necessary touch of tropicalness.

In the first days there is recognized the beauty of the hills, but they are not quite as high as one had expected—not really mountains, on the island upon which is Honolulu; and one misses a wealth of garden flowers. There are no roses, a Japanese beetle having destroyed them all some years ago and successfully prevented their culture since, and the few flowers raised in gardens—as petunias, geraniums, and nasturtiums—seem no more flourishing than in the Eastern States. The banana is stunning but scraggly, and its big leaves have become familiar in California. The graceful pepper tree is not as beautiful here as on the coast; the orange and lemon trees are hardly as good, and for the common date and fan-leaved palm one had no need to cross two thousand miles of ocean. The whole effect is not, in short, the sum of many additions—California plus and plus—and in the first recognition of its algebraic character, that there are deductions to be made, one does feel a little pang of disappointment.

By degrees, however, one turns from subtractions to additions. There is here the wonderful royal palm, its great white trunk making it the most architectural of all God's trees, so that a row of the royal palms is a natural colonnade; there is the ever picturesque cocoanut palm, its long stem shooting off on grotesque curves, like a sky-rocket; there is the far-spreading, hospitable banyan of childhood's picture books; there is the *Poinciana regia*, or flame tree—in February a leafless skeleton rattling long and ugly seedpods, but to be gorgeous later on; there is the marvelous traveler's palm, the useful algaroba, and such vines and hedges! Waste and nearly stagnant ponds are covered with the lotus and with lilies, white and blue; and elsewhere rice fields paint the landscape with their peculiarly fresh green; and the sugar cane waves in the wind, like a corn field yellowish green. Up on the mountain—on Tantalus—one gets among the tree ferns and the wonderful giant vines, and knows at last that the north temperate zone is, indeed, far away.

As for the algaroba, it is much the commonest tree on the islands and much the most useful. But it is not a native, and the mother tree of all the countless brood can still be seen—with suitable label—on one of the principal streets of Hono-

lulu. The tree is suggestive of the pepper in appearance, but not as large, averaging about the size of our apple trees. It was brought to the island in 1837, from Australia, by a Roman Catholic priest, who in that act did as much for the people of the Hawaiian Islands—speaking in a material sense—as perhaps any man who ever went there. The bean is good for cattle and so liked by them that one may see “pastures” without a blade of grass and looking like orchards, and the tree is invaluable as firewood. It has shallow roots, so that one can never tell when a strong wind may lay it low; but it is a rapid grower, and already woods all the islands, while a man need not have a great many trees in his back yard to supply his rather frugal fire needs throughout the year, and yet at the year’s end have as good trees as he had at its beginning!

The wonderful flowering vines are the *Bougainvillæa* and the *Bignonia venusta*—the latter a mass of orange colored bloom—throwing its royal mantle of Holland clear over the roofs of houses, and the former an equally wonderful mass of cerise, or much more rarely of scarlet, flowers. The *Bougainvillæa* is a great favorite, as it well may be, but its commoner color so fights with the color of every other flower in the garden that if one is particular about effect one must plan to set it in plain green. But it is sufficiently beautiful in itself; and when, in walking or driving about Honolulu, one comes on the great splashes of one or the other of these vines—as one very frequently does—any lack of flowers as compared with California is forgotten.

The most familiar hedge is the hibiscus, which is found in all parts of the city. Almost all the time it is thickly covered with large flowers of a bright red, like very wide open red tulips. These lie on the top and sides of the hedge, showing strongly against the green, as if they were pinned there for temporary effect. This also adds much to the floral show of the island. On the stone walls, of which there are a considerable number, the night-blooming cereus is a common hedge or cover. It is said that in front of Oahu College the flowers of the plants number some thousands at a time. In the gardens the most common decorative plant is the croton, which comes in many varieties.

There is little good landscape work. The gospel of the open lawn with massed border planting seemed hardly to be known.

In a few cases a tropical jungle had been attempted; in many more there was an unhealthfully thick planting that was without beauty, or seeming purpose, while in most there were lawns badly "spotted" with palms and other plants. As to the thick planting, the story was that things were put in when small and that when they grew large, as everything soon does there, the owners could not bear to pull them up—which is a probable explanation, but a poor excuse.

There are two "squares" which ought to be ornamental, and of which only one can by the kindest of interpretations be called so; and there is a large park that in most respects is worse than any of the private gardens. But the superintendent is now doing what he can for it, with meager appropriations, and the people are thoroughly aroused, have ideals, and give promise of so nearly realizing them that the conditions I have described must soon be an old story, of which the truth has passed.

In fact, I do not know that I have ever been in a community more thoroughly saturated with "improvement" zeal, and alive with "improvement" effort. There are multitudes of neighborhood clubs—unfortunately more than one, sometimes, on a single street; there is a Central Improvement Committee, which is designed to bring the activity of the various societies into association and harmony—and whose suggestion it was that the government should secure from me a general plan, for which and on which all might work for a better and lovelier Honolulu; and there is an Advisory Committee, made up of local experts in gardening, horticulture and forestry, to whom the technical questions are supposed to be referred. Thus is the movement not only far reaching, but well organized, and it has the support of all classes of citizens and of the government, local and territorial. The very vacant lots, in case after case, have well kept lawns. Honolulu, in the once far-away Sandwich Islands, might give points to most American towns even today in its manifestation of the spirit of town improvement.

Little by little, as one stays on the island—even though one's thoughts be busy with other matters—the charm of the place, its tranquility, its beauty, weave a spell upon one. With little that is awe-inspiring or grand, and nothing that is colossal, peace and loveliness dwell there, pervade all that one sees.

PERSONALIA.

Mr. Charles S. Judd of Honolulu, a student of the class of 1907 in the Yale Forest School, has been appointed Special Forest Agent in the Division of Forestry for a temporary period during the summer.

Mr. Judd will have charge of an investigation of the planted forest on the lands of the Lihue Plantation Company and of Grove Farm at Lihue, Kauai. Careful measurements will be made of the trees on sample areas in stands of varying age to secure data as to the growth in size and height of the trees growing thereon. The figures obtained will serve as the basis for a report on forest planting in the Territory, which it is expected will be issued during the coming year as a Bulletin of the Division of Forestry. The data obtained at Lihue will permit the preparation of yield and volume tables showing what owners of land generally similar in situation, soil and aspect to that at Lihue may expect from forest plantations.

The employment of Mr. Judd to take charge of this investigation is in line with the usage of the United States Forest Service in taking on forest school students to assist in certain of its field work.

Mr. George De Canavarro, the son of Senhor A. S. Canavarro of Honolulu, who is studying forestry at the University of Minnesota, has been appointed a Forest Guard on the Minnesota Natural Forest Reserve, under the U. S. Forest Service.

Mr. A. J. Boyd, editor of the Queensland Agricultural Journal, in a recent letter writes: "I take this opportunity of letting you know how much I appreciate the Hawaiian Forester. I hope to see it grow to double the size ere long."

Mr. F. W. Dickson, who arrived on the S. S. Siberia last month, will spend some weeks in the islands in the interest of the Pacific Distributing Company of San Francisco, which has lately been organized to handle Hawaiian fruits and agricultural products. During his stay here Mr. Dickson will visit Maui and Hawaii and the chief agricultural districts of the different islands.

In a recent letter from the Rev. William M. Jefferies is included the prospectus of a series of lectures which he is about to deliver. In a two years' tour of the world Dr. Jefferies visited Europe, Egypt, Arabia, India, Ceylon, the Straits Settlements, China, Korea and Japan, and finally spent some months in Hawaii. He is therefore peculiarly fitted to pass judgment upon the islands and to compare them with other countries. He does so in the following terms:

"When the world awakens to the realization of the fact that in Hawaii fifteen tons of sugar can be raised on an acre, as compared with two tons in Louisiana; that this most charming spot on all the earth—where religion and education unite to produce a most charming social life—has palatial hotels that are unsurpassed by those to be found anywhere; that its volcanoes, extinct and active, are the greatest on the earth; that the opening of the Panama Canal will make Hawaii the 'Port of Call' between the Orient and the Occident; then it will flock—'as doves to the windows'—to these romantic islands, where the sun shines every day of the year, and where health and happiness combine with pecuniary profits to make the life there singularly ideal."

THE SOY BEAN.

The Soy bean is cultivated extensively in China and Japan and is used for food in the form either of a sauce, or the seeds are compressed into a paste or cake. Soy is said to enter largely into the composition of many American and European sauces. After the preparation of the sauce the exhausted cake 'mass' supplies an excellent food for cattle. The plant is used largely for fodder and is also valuable as a green manure. The cultivation of the Soy bean is simple and is remarkable for the short time in which it matures its crop. The plants are said to blossom when a month old, and the crop is picked in from six to eight weeks after the seeds are sown. In view of the enormous quantities of Soy imported into Hawaii there seems to be a profitable field for the growth of the bean in these islands.

RECENT PUBLICATIONS.

BULLETIN NO. 12.

The Mango in Hawaii, by J. E. Higgins, *Horticulturist Hawaii Agr. Exp. Station. Washington, 1906.* This bulletin is one of the most interesting and instructive to general readers that we have read from the pen of Mr. Higgins. The mango is often called "the king of fruits," but while none who have had the pleasure of tasting the more choice varieties of this delicious tropic product, will deny its high claim for prominence, a distinction such as that conferred by the term we have quoted, seems more deserved by one or other of those less pretentious fruits which have by their simple qualities and utility earned for themselves a recognized position in our domestic economy. As is well known the mango is not indigenous to Hawaii, although its congener, the Wi (*Spondias dulcis*), holds a place among Polynesian flora. Other nearly allied trees to the mango common in Honolulu are the Cashew nut and the pepper tree. The cultivation of the mango has been carried on in India from the earliest times, but its introduction here was probably from Mexico, although more recent importations have been made from many parts of the world. There has recently been exhibited in a Honolulu store, fruit from the reputed first mango tree which was planted here. The quality of the mango fruit grown in Hawaii is generally mediocre, and as there are so many high class varieties of delicious flavor which bear about the same relation in quality as that borne by a good apple to the "crab," it is certainly well worth while to endeavor either to replace our inferior trees by those of better quality or to use our old stock for careful grafting. This is the more important when it is remembered that as far as the great majority of our population is concerned the mango in Hawaii is indeed "king." Mr. Higgins in his bulletin, urges the extensive cultivation of mangoes for export to the mainland where an almost unlimited market awaits exploitation. The whole subject of propagation, grafting, transplanting and general cultivation are dealt with at length, as well as directions for picking and marketing the fruit. Directions are also given to allow the novice to eat the mango, and attention is directed to the different uses of the fruit, in which connection receipts are given for the manufacture of chutney, marm-

lade and jelly. Finally a detailed list of forty-two of the best known varieties are given, several of which are referred to in Dr. Gifford's Florida Notes, which we published last month. The bulletin contains ten full page plates, and we cordially recommend it for general reading throughout the Territory.

BULLETIN NO. 13.

The Composition of Some Hawaiian Feeding Stuffs, by Edmund C. Shorey, Chemist, Hawaii Agricultural Experiment Station. Washington, 1906. In response to frequent requests received by the Experiment Station requesting the composition of Hawaiian grown feeding stuffs, Mr. Shorey has prepared this bulletin. With regard to the commonly cultivated plants of which analyses are available, the question arose as to how far the average analyses of plants grown elsewhere represent the composition of Hawaiian grown crops. In other words, it was desirable to ascertain whether our climate, soil and methods of cultivation exercise any special effect upon the composition of the crops. To answer this question and also supply data, a series of analyses has been conducted as part of the regular routine work of the chemical laboratory of the station. The first results of these experiments is published in the bulletin. The first group of feed stuffs to be treated were the various saccharine and non-saccharine sorghums, including sorghum, sugar-cane tops, millet and Kaffir corn. Of wild and cultivated grasses thirteen varieties are enumerated as having been subjected to analyses, including Guinea grass (*Panicum jumentorum*), Para grass (*Panicum molle*), and Water grass (*Paspalum dilatatum*), Barnyard grass (*Panicum crus-galli*), Manienie or Bermuda grass (*Capriola dactylon*), Hilo grass (*Paspalum conjugatum*), Buffalo grass (*Stenotaphrum secundatum*), Pilipiliula (*Chrysopogon aciculatus*), Kukaipua (*Syntherisma sanguinalis*), Pili grass (*Heteropogon contortus*) and Yard grass (*Eleusine indica*).

Among Leguminous forage crops were treated Alfalfa, Wild Cowpea, Cowpea and Spanish clover and the following forage weeds were also examined: Pigweed, Pualele or sow thistle (*Sonchus oleraceus*), Honohono (*Commelina nudiflora*) and Ki (*bidens pilosa*). Most of the weeds analyzed were very succulent, that is, they contained a very small proportion of nutritive

material and a large proportion of water. The ki, however, differed in this respect, the water being fairly low and the proportion of nutritive material fairly high.

Cactus, or prickly pear, banana tops and butts, sweet potato tops, ti leaves, kiawe beans and root crops were also analyzed, besides many commercial products. A fact of special significance shown by the experiments shows that Hawaiian feeding stuffs, especially grasses are, as a rule, deficient in lime, which food constituent, should be supplied by leguminous plants or other means.

"Hals suggests that a deficiency in lime may be remedied by adding suitable mineral matter to the ration, precipitated dibasic calcium phosphate being considered superior for the purpose to bone meal, bone ash, or similar very indigestible materials."

The Influence of Stripping on the Fields of Cane Sugar, by C. F. Eckart. Bulletin No. 16, Division of Agriculture and Chemistry, Hawaiian Sugar Planters' Association. Under the above heading Mr. C. F. Eckart presents the data obtained by a series of painstaking tests conducted at the Experiment Station, which go to show that under certain conditions much sugar is annually lost by plantations practicing stripping, although stress is laid upon the fact that the question is a local one and that in order to demonstrate the practical utility of the investigations careful field tests must be first made upon the various plantations. As introduction to his subject, Mr. Eckart writes:

"Probably no subject relating to the field operation of the sugar industry in these islands has been more freely discussed by plantation managers than that of stripping, or the removal of dried leaves from the cane stalk. Widely divergent opinions are held as to the economy of this expensive practice, and owing to the radically different conditions under which cane is grown in this country, it is natural that the experience of some plantations, in this particular, has not always been in conformance with that of others. The question is largely a local one and the profits or losses from stripping are determined by the conditions under which the operation is performed. These controlling factors have, in recent years, become so involved through the ravages wrought by the leaf hopper pest and fungus diseases that the most careful judgment is now required to determine whether or not the practice may be employed to advantage in any given instance."

The Luquillo Forest Reserve, Porto Rico, by John C. Gifford, D. Occ. Agent, Bureau of Forestry, Washington, 1905, 8 vo., 51 pages, 8 plates.

This publication, which constitutes Bulletin No. 54, of the Bureau of Forestry, U. S. Department of Agriculture, has been received from Dr. Gifford and is interesting to Hawaiian readers on account of the comparison which it suggests between the forestry conditions existing in Porto Rico and our own islands. Speaking of the animal life in the former, the writer says:

"Injurious animal life, in fact animal life of any kind, is strikingly absent. One can spend a long time in the reserves without seeing any wild animals except small lizards, tree toads and a very few birds. Even insects, such as butterflies, are very scarce. The absence of many forms of animal life is often accountable for by the presence of the mongoose, which was introduced to exterminate rats on sugar plantations, and he has succeeded in exterminating most of the animals within reach, but is so wary that he is rarely seen."

Trade winds, as in Hawaii, blow throughout most of the year, and being laden with moisture, allow the sheltered portion of the reserve to be clothed with luxuriant vegetation. As a rule, rain does not fall continuously, except during severe storms, but as a rule drenching showers alternate with bright sunshine. These showers are usually very local and one can often watch and hear them in the distance. So sudden and heavy are the downpours in the mountains at times that a quiet brook becomes a raging torrent and subsides again to its normal condition in a couple of hours. There is less rain in the daytime than at night. Parts of the island are drenched with water most of the time and other parts within a half a day's ride are dependent upon irrigation. In parts of the island the rainy and dry seasons are pronounced, but on the reserve it is rainy throughout the year.

The highest temperature recorded in Porto Rico for 1902 was 98°, and the lowest 60°. The annual mean temperature for the year was 77.8°.

The density of the jungle, the abundance of worthless weeds, the absence of roads and trails, the frequent rains which soften the soil and render the mountain paths impassable, all add to the difficulty of work upon the reserve. The heat and rain interfere

to such an extent that with the best workers only a small part of which is accomplished in more salubrious climates can be expected. The water, however, is good and the region is free from mosquitoes, flies and other obnoxious insects. Danger to health lies in three sources, exposure to the sun, lack of proper food, and most serious of all, the impossibility of keeping one's clothing dry. In the wake of this last come inevitably malarial fevers, dengue and tropical dysentery.

Successful cultivation of coffee, fruits, cacao and similar products is dependent upon windbreaks, and only in sheltered sites is luxuriant tree growth developed. Hurricanes are experienced during August and October when the eastern trades become uncertain.

In those parts of Porto Rico which are free from excessive winds, and where the rainfall is plentiful and uniform, a heavy growth of timber is developed. The most prominent characteristic of the Luquillo forest is its diversity and the great number of little-known species in mixture. It is rare to find trees of the same species in considerable number together. The tree which is most gregarious in habit is the mountain palm (*Acrista monticola*, Cook). This tree is of no commercial value whatever, and has complete control of extensive areas. It grows thickly and produces an immense amount of seed which germinates quickly on the wet ground. In looking down upon the forest it appears like a sea of palms covered with islands of dark-leaved hardwoods. The mountain palm is a true forest weed. With its tall stem and broad leaves it presents a beautiful and tropical appearance, but if the reserve is ever to be of value, the extinction of the palm will be necessary.

Excluding the palm and brush areas, there is left a belt of mixed timber close to the lines of the coffee plantations, in which are found quantities of the best timber, but the utility of these is as yet undeveloped.

The industries of the reserve are almost entirely agricultural. Except for sugar, hides and coffee, which are exported, the region barely yields enough to support the native population, which subsists mainly on bananas, yautia, rice and other similar products raised in little patches on hillsides. When the fertility of one patch is exhausted, another is cleared and the old one allowed to be taken possession of by weeds, brush and grass.

A few people are engaged in lumbering. The trees are felled

and cut into short logs with crosscut saws. The timber is sawed into boards in the woods on a rough staging built of poles, tied together with withes. A sidehill is chosen for the operation, which is the same as the old pit sawing, still practiced in modified form throughout the world where timber is not very plentiful and labor is cheap. The system in Porto Rico is slightly different from that generally followed, in that the log is first squared and then the boards are cut, but not completely severed. The log is then hauled down slippery paths and through much mud until a road is reached. The hauling is accomplished by oxen, yoked by their horns, to which yoke the timber is chained. Stakes driven along the paths prevent the stick from sliding down hill in turning sharp curves. The big-horned oxen, with heads to the ground, groaning and often bleeding from the goads, plunge recklessly down the narrow paths. A man behind yells in warning and the traveler must often turn back until he finds a place wide enough for them to pass. Sometimes the timber is cut into boards and carried on the backs of men.

In the manufacture of fine cabinet work the native carpenter is an adept. It is only for this purpose that these timbers can be profitably used, since for ordinary construction imported lumber can be sold more cheaply in the local market. A trade in wood carving similar to that of Sorreto in Italy could be easily developed in Porto Rico and would furnish remunerative labor to the poor natives.

The sugar and fruit industries of the reserve are extending, but coffee lands are neglected, unprofitable and rapidly deteriorating. Much of it is going back to forest, much is being sold for taxes and probably much more will be sold before conditions improve. Coffee was at one time the principal product of the island. Today it hardly pays the picking.

Cacao is growing well in the Luquillo region. It requires conditions similar to coffee and is also a semi-forest crop. Coconuts are shipped in considerable quantities in sailing vessels and there is also a small copra factory.

One grower near Orlando picked 750 boxes of grapefruit from 250 trees last season and sold them for \$3,000.—*The Florida Agriculturist*.

PROTECTION OF FORESTS FROM FIRE.

Of all the dangers to which a forest plantation is exposed, fire is the greatest. Insects, fungi, and natural factors,—such as storms and droughts,—frequently occasion losses among the young plants. But the damage done usually extends over only a small portion of the area planted and can be repaired at comparatively little expense.

A forest fire, however, if it once gains headway, may sweep over the entire plantation, entailing a total loss. This fire hazard of course is greatest while the plants are young, but is present in decreasing amount throughout the life of the forest. Every landowner, before establishing a plantation, should seriously consider the problem of fire protection. If protection can be secured at a reasonable cost, the plantation may be established; but if protection from fire can be obtained only through large expenditures, the idea of planting should be abandoned.

As a matter of fact, fire protection in a majority of cases can be secured very cheaply, when once the attempt to do so is made.

Efforts to protect a plantation from fire must vary in individual cases, but will be along two main lines, as follows:

(a) Toward the construction of fire lines.

(b) Toward patrol of the plantation.

By a fire line is meant a narrow strip of land, a few feet wide, bordering the area to be protected, and kept clear of all inflammable material. A roadway or else a ploughed strip make the best kind of fire lines. Where the ground cannot be ploughed, all dead branches and leaves should be removed and the fire line burned over occasionally to keep down the grass. The ordinary surface fire will not pass such a fire line, which can be constructed for \$10 a mile as the maximum cost.

Where the area to be protected is of considerable extent, it may be wise to have a man keep watch of, or patrol, the plantation during the dry seasons in each year. Unless the tract contains several hundred acres or more the cost of such a patrol would be excessive, were paid for outright. But small landowners are often so situated that they can keep watch of their plantations themselves, without great inconvenience, thus obtaining fire protection at small cost. When the owner has become convinced that he can secure adequate fire protection for his prospective forest plantation, and not until then, is he ready to think seriously of planting.—The Massachusetts Tree Planter.

REPORT ON HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, T. H., August 8, 1906.

To the Honorable

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Since my last report to you at your meeting June 20th last, I have to report the following synopsis of work done in the Entomological Division:

ARRIVALS.

During that time fifty-eight (58) steamships and sailing vessels have entered the port of Honolulu from outside the Territory. We found the following freight, twelve thousand eight hundred and fifty-seven (12,857) packages of fruits and vegetables; fifteen (15) packages of plants and twenty-nine (29) packages of plants and seeds by mail.

MISUNDERSTANDING REGARDING PLANT AND FRUIT FUMIGATION.

We are frequently accosted by parties that have received plants—especially by mail—"that their plants were killed by fumigation," whereas the facts are no plants are even injured by that treatment nowadays, as we fully understand the amount of hydrocyanic acid gas each species will stand and the time exposure required to destroy the various class of insects to be treated. Parties receiving such plants, seldom, or never take into consideration that their plants have been in transit from eight to twenty days, under conditions other than natural. In most cases they are shriveled and dried up and such soft wooded plants as geranium, heliotrope, petunia, etc., are packed tight with all their foliage to heat and rot and when they arrive are in anything but growing condition, and instead of being the fault of the inspectors and fumigation, we frequently are the means of rescuing plants from death by applying a little moisture to the roots of those that are very dry, or by removing the rotted leaves and stems of others. The postmaster, or one of his assistant's attention is always called to such packages when they arrive in bad condition.

CHINESE BENEFICIAL INSECTS.

On July 6th I addressed a letter to the Honorable Amos P. Wilder, U. S. Consul General at Hongkong, China, informing him that we would send four small orange trees in tubs by a subsequent steamer to his care with the request that he kindly turn the trees over to an American horticulturist to care for them until called for by either Mr. George Compere, beneficial insect collector of California, or Mr. F. Muir, one of the staff of entomologists of the Hawaiian Sugar Planters' Association, both of whom are expected to soon visit China in search of beneficial insects. I had personally instructed both gentlemen regarding the object of sending the trees infested with certain scale insects that we desire stocked with their natural enemies or checks that we know exist in China, consisting of very minute Chalcid, Hymenoptercus flies. On July 12th the trees were forwarded to Hongkong per S. S. "Siberia," freight charges prepaid, and further instructions sent to Consul General Wilder and George Compere. In a former letter to Mr. Wilder I directed that no fumigation of the trees be allowed in China, as it was necessary that the various scale insects reach there alive. Mr. Haughs and Mr. Austin assisted in packing the trees for their long voyage.

ECONOMIC PLANTS FROM WASHINGTON, D. C.

Four large cases of Cacao (370) plants and six small Mango trees arrived on July 6th per S. S. "Alameda" from the Department of Agriculture, Washington, D. C., via San Francisco. The Cacao plants had been thoroughly treated with Bordeaux mixture and on the Mango trees we found a few very small "Florida red scale" (*Chrysomphalus ficus*) which upon microscopic examination we found were dead—evidently having been fumigated before shipment.

SOIL BALLAST CONDEMNED.

On Sunday, July 15th, the large four-masted American iron ship "Atlas" arrived from Yokohama with a cargo of soil ballast containing vegetable matter and roots. As the laws of the Territory and your regulations positively prohibit the landing of such material we notified Captain Amberman and the agents of

the Standard Oil Company, to whom the "Atlas" belongs, that the ship would have to discharge her ballast outside the harbor into the ocean. The captain was afraid that his ship would "turn turtle" when the ballast was removed. We advised that sufficient sugar be taken on board to stiffen her as that will form part of her cargo on her voyage to the mainland. The ship was towed out and discharged her cargo at an expense of six hundred and forty-five (\$645.00) dollars. The time occupied in the work was seven days.

ALLOWABLE BALLAST.

This Territory has suffered enough loss from insect pests and plant diseases in the past without taking such risks of adding other species to the list. There is no restriction to sand or rock ballast. Covert hints and threats have been freely circulated along the water front that the Standard Oil Company would commence legal proceedings against the Territory to recover supposed damages. The passage of a law holding parties liable for damages that occur from introduced pests or diseases into a section would have a wholesome effect upon some importers that labor under the belief that the United States is a free country and they can do as they please.

FEDERAL PROTECTION.

The Federal Government passes laws against the possible introduction of plague, cholera, yellow fever and other diseases; and the States and Territories are left to protect themselves against the possible introduction of pests or diseases that have caused losses of millions of dollars to the products of their soils, vide "Gipsy moth" in Massachusetts, "Cotton boll weevil" in the South, and the "San Jose scale" that was introduced into California and is now spread over the States and into Canada, besides scores of other pests that have been introduced into the country.

IMPORTS FROM CUBA.

On July 18th the S. S. "Sierra" arrived from San Francisco having on board two (2) boxes of plants from Cuba. Some small seedling palm trees showed traces of that disgusting introduced pest (*Pseudococcus nipae*) of the avocado pear tree, guava and

other Island products. This proves the existence of that scale in Cuba, and as the scales were not very plentiful it is possibly preyed upon by parasites or predacious insects and an effort will be made to ascertain the cause of its scarcity. The soil in which the seedling palms were packed was dumped into the water.

INFESTED ORANGES.

Twenty-four (24) boxes of oranges infested with three species of scale insects ex S. S. "Sierra" were deported. The grower did not think enough of his product to put his name or locality on his boxes, only the commission merchant's name appearing in small letters upon the end of each box.

CONDEMNED APPLES.

Ten (10) boxes of apples infested with Codlin moth larvae, "brown spot fungus" and "apple scab" that came on the same steamer were destroyed by fire. The grower of this fruit was evidently also ashamed of his product, for the boxes were not stenciled or marked with the grower's name or address. Had the fruit been free from insect pests and plant diseases this—according to the laws of this Territory—would have been sufficient grounds to have refused the entry of the fruit. This is a valuable point, for we can determine promptly if the fruit is liable to be infested with maggots of fruit flies or is from a district subject to them.

NEW FRUIT TREES.

We have on various steamers for Brisbane, Queensland, forwarded packages of *Ceroplastes rubens* to Mr. L. G. Corrie, President of the Queensland Acclimatization Society in hope of establishing the parasite that keeps that scale insect in check in this Territory. Mr. Corrie has very kindly sent us, freight prepaid, three new mandarin orange trees that originated there and is considered to be the finest mandarin orange in the world. One of the trees will be planted on the uplands of Tantalus, one in Nuuanu Valley and the other in the vicinity of Honolulu. This will thoroughly test their adaptability to the various elevations. Buds will be taken later for general distribution. A variety of persimmon and a variety of mango called "Rose," three small palm trees and a scarlet Ipomea, with the exception of the latter,

all were in fairly good condition, but had dropped their leaves, except the palms.

FLY PARASITES.

In my report to you on May 16th I referred to the receipt of two jars of possible horn fly parasites that we received from Prof. Koebele, which he collected near the Mexican border in Arizona. The insects were turned over to Mr. Kotinsky for propagation. He placed the parasites in breeding jars containing "horn fly" and other dung fly maggots and pupae. On June 4th the first local bred parasites issued. A second generation was again bred out on June 29th and on July 25th he had the fly parasites in such numbers that they were sent out to the principle cattle men on the various Islands and liberated by him in various desirable districts of this Island.

"TORPEDO FLY EGG" PARASITES.

It gives me pleasure to again report the discovery of new districts where this very minute but valuable imported parasite has established itself, and Mr. Kotinsky has distributed further colonies to other districts.

DARK ROOM.

The former fumigating house connected with this station and located on the grounds has not been used for that purpose since the construction of other rooms for that work on the docks and is now being converted into an up-to-date photographic "dark room" where Mr. Kotinsky will develop his plates of entomological subjects, etc. This room will be used by all the divisions of your Board for photographic development.

Respectfully submitted,

(Signed) ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT
OF KAU, ISLAND OF HAWAII.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands in the Kau District, Island of Hawaii, lying on the lower Southern slope of Mauna Loa, bounded on the West and North by the land of Kahuku, on the East by the forest fence erected within the lands of Kapapala by the Hawaiian Agricultural Company, and on the South by a line drawn across the various lands back of the Pahala and Hutchinson plantations, at approximately the lower edge of the existing forest, and containing an approximate area of 65,850 acres, in the District of Kau, Island of Hawaii, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a Forest Reserve Monument in the woods at "Puulepo," at the North corner of Kioloaka—Keea Homestead Lot 3, on the boundary between Waiohinu and Kahilipalinui, the true azimuth and distance to Government Survey Trig. Station "Haao" being $281^{\circ} 23'$, 4383.5 feet, as shown on Government Survey Registered Map No. 2361, and running:

First along the Kioloaka-Keea Homesteads as by survey of Messrs. Emerson and Harvey:

1. S. $82^{\circ} 17'$ W. true 2965 feet along Homestead Lot 3 and across reservation for 40 foot road to "+" on pahoeohoe;

2. S. $82^{\circ} 32'$ W. true 2219 feet along Homestead Lot 4 to "[triangle with dot in center]" on solid rock and ahu at Kaiuwai at a point from which "Puu o Lokuaana" Trig. Station is S. $59^{\circ} 34\frac{1}{2}'$ w. 13,870 feet and "Kaa-na-manu" Trig. Station is S. $30^{\circ} 6\frac{3}{4}'$ W. 4682 feet;

3. S. $77^{\circ} 8'$ W. true 1800 feet along the same to "[triangle with dot in center]" on solid rock and ahu on a hill at Ohia-lele;

4. S. $89^{\circ} 33'$ W. true 2408 feet along Homestead Lots 4 and 8 to "[triangle with dot in center]" on solid rock and ahu on rocky hillock at Kaleleao;

5. S. $68^{\circ} 57'$ W. true 2975 feet along Homestead Lot 8 to a "+" on stone and ahu at the base of a lofty ohia tree at Waia-Kooloa, whose coordinates referred to "Akihi" are 3293 feet South and 4583 feet East;

Thence following the boundary of Kahuku as per bearings and distances taken from Boundary Certificate No. 85 to points marked on the ground by Messrs. Emerson and Harvey for the Government Survey as follows:

6. N. $20^{\circ} 30'$ W. mag. 2706 feet to "+" on stone and ahu in woods;

7. N. $38^{\circ} 00'$ W. mag. 7920 feet to "+" on stone and ahu on Keapoo-hina aa flow near its terminus;

8. N. $16^{\circ} 45'$ W. mag. 15,444 feet to "+" on stone set in aa and ahu on site of F. S. Lyman's old ahu at the North corner of the land of Kiolokaa;

9. $37^{\circ} 15'$ W. mag. 1327 feet to "+" on aa boulder set on edge of aa flow near edge of Koa and Ohia forest on site of F. S. Lyman's old ahu;

10. N. $48^{\circ} 15'$ E. mag. 335 feet to "+" on stone and ahu on the South side of a Koa stump 40 feet high and $5\frac{1}{2}$ feet in diameter marked "X" on 4 sides by F. S. Lyman at the Northwest corner of Waiohinu;

11. N. $45^{\circ} 30'$ E. mag. 12,210 feet to "+" on solid pahoe-hoe rock and ahu in scrub ohia;

12. N. $16^{\circ} 30'$ W. mag. 825 feet to "+" on pahoe-hoe rock and ahu on upper edge of ohia forest;

13. N. $46^{\circ} 15'$ E. mag. 4818 feet to "+" on pahoe-hoe and ahu by a large ohia tree marked "X" on makai side on edge of forest;

14. N. $35^{\circ} 00'$ E. mag. 2541 feet to large "+" on pahoe-hoe rock by ohia tree blazed on 4 sides on edge of ohia forest;

15. N. $13^{\circ} 30'$ E. mag. 2030 feet to "+" on stone and ahu on edge of woods;

16. N. $76^{\circ} 00'$ E. mag. 2640 feet to "+" on stone and large ahu in open land near edge of forest;

17. N. $32^{\circ} 00'$ E. mag. 4752 feet to "+" on large stone and ahu, on site of former ahu, on hillock at North corner of the land of Kaalaiki and about 250 feet mauka of forest;

Thence following the boundary of Kahuku as per bearings and distances taken from Boundary Certificate No. 85, as follows:

18. N. $46\frac{1}{2}^{\circ}$ E. mag. 15,444.0 feet to an ohia tree marked "K" on North side and "V" on South side;

19. N. $42^{\circ} 00'$ E. mag. 7524.0 feet to an ohia tree marked X on 4 sides;

20. N. $30\frac{1}{4}^{\circ}$ E. mag. 15,840.0 feet to an ohia tree marked X and X in edge of timber;

21. N. $23^{\circ} 00'$ E. mag. 6765.0 feet to Forest Reserve Monument on site of old "[diamond with dot in center]" and "W" koa tree at the corner of Kaalaala on the boundary between Kahuku and Kapapala, the co-ordinates referred to Government Survey Trig. Station "Kamakaia" being N. 14,722.0 feet, W. 50,274.0 feet;

Thence running as follows by true azimuths, as by survey of Geo. F. Wright:

22. $234^{\circ} 54'$ 9625.0 feet along Kapapala Remainder to North corner of Kapapala Forest Reserve fence;

Thence following along Kapapala Forest Reserve fence, the direct azimuths and distances being:

23. $299^{\circ} 54'$ 16,477.0 feet to large ohia at East corner of Kapapala Forest Reserve fence, the co-ordinates referred to Government Survey

Trig. Station "Kamakaia" being 12,043.0 feet North and 28,113.0 feet West;

24. $21^{\circ} 37'$ 18,375.0 feet to Forest Reserve Monument at Kapapala Forest Reserve fence, near edge of small bluff, the true azimuths and distance to "Kamakamaka" Trig. Station being, $343^{\circ} 52'$, 11,930.0 feet;

25. $80^{\circ} 56'$ 711.0 feet to ohia post;

26. $48^{\circ} 39'$ 839.0 feet to Forest Reserve Monument on the West boundary of Kapapala;

27. $5^{\circ} 03'$ 856.0 feet to an iron pipe;

28. $338^{\circ} 20'$ 997.0 feet to "F. L." on a large solid rock, the true azimuth to "Kamakamaka" Trig. Station being $334^{\circ} 13'$;

29. $347^{\circ} 00'$ 1050.0 feet down hillside to "F. L." on set stone and ahu in mud flow on the East side of Wood valley, the true azimuth and distance to "Kamakamaka" Trig. Station being $332^{\circ} 44'$, 8990.0 feet and to "Kauhao" Trig. Station being $59^{\circ} 15'$, 7813.0 feet;

30. $101^{\circ} 49'$ 1238.0 feet along edge of cane on the East side of Wood Valley to "F. L." on young ohia tree;

31. $130^{\circ} 35'$ 3933.0 feet along edge of cane on the East side of Wood Valley to Forest Reserve Monument, the true azimuth and distance to "Kamakamaka" Trig. Station being $322^{\circ} 24\frac{1}{2}'$, 13,636.0 feet;

32. $74^{\circ} 28'$ 1490.0 feet along edge of cane on the East side of Wood Valley to ohia post;

33. $38^{\circ} 04'$ 1926.0 feet along cane edge to Forest Reserve Monument, the true azimuth and distance to "Kamakamaka" Trig. Station being $309^{\circ} 5'$, 14,098.5 feet;

34. $17^{\circ} 23'$ 3710.5 feet to "F. L." on large solid rock on top of pali on the West side of Wood Valley;

35. $2^{\circ} 40'$ 1637.0 feet to Government Survey Trig. Station "Kahaha," the true azimuth and distance to "Puu Enuhe" Trig. Station being $22^{\circ} 18' 27''$, 35,177.0 feet;

36. $20^{\circ} 40'$ 13,557.0 feet to Forest Reserve Monument in Paaau 1, just mauka of flume, the true azimuth and distance to "Alili" Trig. Station being $9^{\circ} 25'$, 5027.5 feet;

37. $54^{\circ} 40'$ 11,885.0 feet to Forest Reserve Monument on "Kaumai-keohu Peak" (Clouds Rest), in Moaula, the true azimuth and distance to "Puu Enuhe" Trig. Station being $355^{\circ} 4\frac{1}{2}'$, 13,033.0 feet, to "Mill" Trig. Station being $282^{\circ} 33\frac{1}{2}'$, 21,608.0, to "Alili" Trig. Station being $257^{\circ} 50'$, 9079.5 feet;

38. $18^{\circ} 54'$ 10,525.0 feet to Forest Reserve Monument on Puu Enuhe ridge on the boundary between Punaluu and Wailua, the true azimuth and distance to "Mill" Trig. Station being $257^{\circ} 53'$, 25,057.5 feet;

39. $57^{\circ} 26'$ 895.5 feet to "[triangle with dot in center]" on ohia tree at the North corner of Lot 52 Ninole-Wailua Homesteads;

40. $49^{\circ} 10'$ 3728.0 feet along Ninole-Wailua Homesteads to Forest Reserve Monument at the North corner of Lot 15 on the West side of 30

foot road, the true azimuth and distance to Forest Reserve Monument on Puu Enuhe Ridge being $230^{\circ} 46'$, 4616.0 feet;

41. $11^{\circ} 09'$ 1540.0 feet along Ninole-Wailua Homesteads to Forest Reserve Monument at the West corner of Lot 16 and South corner of Lot 15 on the East side of 30 foot road, the true azimuth and distance to Forest Reserve Monument on Puu Enuhe Ridge being $219^{\circ} 31\frac{1}{2}'$, 5889.0 feet;

42. $43^{\circ} 25'$ 1450.0 feet to Forest Reserve Monument, the true azimuth and distance to the West corner of Lot 14, Ninole-Wailua Homesteads, being $279^{\circ} 25'$, 65.0 feet, and to Forest Reserve Monument on Puu Enuhe Ridge being $221^{\circ} 35'$, 7336.5 feet;

43. $25^{\circ} 37\frac{1}{2}'$ 5353.0 feet to Forest Reserve Monument on Puu Iki, the true azimuth and distance to "Kumuohelo" Trig. Station being $4^{\circ} 46'$, 18,111.0 feet, to "Papaloa" Trig. Station being $319^{\circ} 12'$, 8396.0 feet, to "Puu Enuhe Ridge" Trig. Station being $214^{\circ} 51'$, 12,562.5 feet, and to "Kaumaikēohu" Trig. Station being $207^{\circ} 35'$, 22,866.5 feet;

44. $24^{\circ} 40'$ 17,057.0 feet to Forest Reserve Monument at Puulepo, a small rise at the North corner of Honuapo on the boundary of Hionaa, the true azimuth and distance to "Kumuohelo" Trig. Station being $114^{\circ} 15'$, 6165.0 feet, and to "Puu Enuhe" Trig. Station being $219^{\circ} 25'$, 29,687.5 feet;

45. $47^{\circ} 20'$ 2000.0 feet to gulch at the Northwest corner of Honuapo on the boundary of Kioloku, the true azimuth and distance to a Forest Reserve Monument on the East side of gulch being $227^{\circ} 20'$, 35.0 feet;

46. $58^{\circ} 32'$ 7035.0 feet along Kioloku and Kaunamano Homesteads to "W" in bed rock of gulch on the boundary between Kaunamano and Kahilipalinui;

47. $56^{\circ} 08'$ 7156.0 feet across Kahilipalinui and Waiohinu to point of beginning.

	Acres.
Land of Kahilipalinui (Hutchinson Sugar Co.) contains.....	165.0
Land of Hileanui (Hutchinson Sugar Co.) contains.....	2,620.0
Land of Hileaiki contains.....	37.0
Land of Punaluu (Bishop Estate) contains.....	1,275.0
Land of Paaauu 2 (Bishop Estate) contains.....	1,675.0
Land of Keaiwa (Hawaiian Agricultural Co.) contains.....	460.0
All Government lands	59,618.0

Total Area of Kau Forest Reserve..... 65,850.0

AND I do hereby set apart as the Kau Forest Reserve those portions of the Government lands known as Kapapala, Moaula-Kopu-Makaka Mauka, Mohokea 1 and 2, Ninole-Wailua Forest and Kaalaiki, (respectively and more particularly described in Public Lands Office Leases, Nos. 106, 297, 454, 429 and 299); the unleased portions of Kauhuhuula Forest, Kaalaiki (mauka), Kioloku, Kawala-Kaunamano and Hionaa-Hokukano (the

last two being respectively and more particularly described in the expired Public Lands Office Leases Nos. 420 and 421); and also any other remnants of government land not under lease, within the metes and bounds of the above described Kau Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 2nd day of August, A. D. 1906.

GEORGE R. CARTER,
Governor of Hawaii.

By the Governor,

A. L. C. ATKINSON,
Secretary.

RUBBER.

The Government of Brazil has decreed a prize of 30,000 dollars for anyone who exhibits 100,000 Manicoba rubber trees (*Hancornia speciosa*) within eighteen months from December, the date of the announcement; and three other prizes of 15,000 dollars, 10,000 dollars and 5,000 dollars, respectively, for the three next largest plantations, the smallest of which, in order to gain a prize, must not be less than 10,000 trees. It appears that, not to speak of the value of the rubber, the coffee trees benefit greatly by the shade afforded by the rubber trees.—*West India Committee Circular*, 19th January, 1906.

For a money crop in the sub-tropical region of Florida, avocados have a very promising look. During the last five years a very large amount of work has been done in systematizing the varieties and in working up the methods of propagation.—*The Florida Agriculturist*.

**FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR
SALE AT THE GOVERNMENT NURSERY.**

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

CHAS. S. JUDD, Special Forest Agent.

RALPH S. HOSMER,
Superintendent of Forestry.

**PUBLICATIONS FOR DISTRIBUTION.
BOARD.**

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

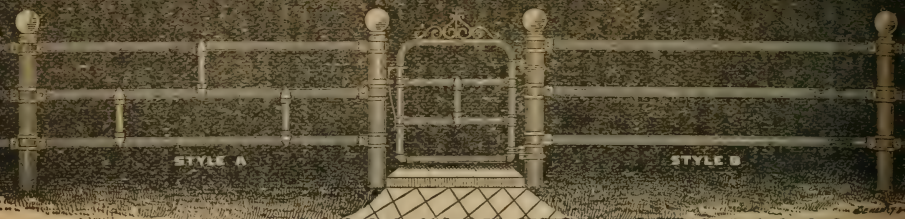
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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Manager THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly, ISRAEL W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

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No. 9

Statistics have recently been published by the Bureau of Statistics of the Department of Commerce and Labor, showing the trade returns between Hawaii and the United States mainland for the twelve months ending June, 1906, as compared with the previous fiscal year. A careful analysis of the returns show that during the year just ended, encouraging progress has been made, chiefly in what are known as our diversified industries. The shipments to Hawaii from San Francisco, New York and Los Angeles in each case decreased during the year in question, while Puget Sound increased its shipments from \$738,380 to \$1,266,367.

With regard to Hawaiian exports to the mainland our staple product only amounted to \$23,840,803 as against \$33,946,036 in the previous year, leaving the enormous deficit of \$10,105,233. It is, however, gratifying to learn that our exportation of refined sugar increased by over half a million dollars during the same period. The refining of sugar in Hawaii is confined to one plantation and is among one of the newest of our industries. The increase in this direction may therefore be regarded as of special importance.

Exportation of honey and bees-wax increased to the extent of \$46,450, coffee increased \$74,976, canned fruits increased \$85,706, hides and skins \$42,333, leather \$14,592, tallow \$7,046, rubber \$1,028, and rice \$141,598.

The increase in canned fruits is chiefly attributable to the development of the pineapple industry, and this item will no doubt continue to develop with marked strides for many years. The export of rubber will, in a very short time, figure conspicuously in the return and will probably form one of our most valuable assets. The production of leather, another of our new industries, has also materially increased, and promises to still further develop. While the sales of Hawaiian rice on the coast have about doubled during the last fiscal year, the

figures are not to be relied upon as a true criterion of the condition of this industry. This commodity figures largely in the importations from the coast, and the statistics at hand do not show the importation of rice from Japan. The consumption of Japanese rice in these islands is very large and would throw an interesting light on the question. There is no doubt, however, that the Hawaiian rice industry has improved its condition materially during the last year. The coffee growers and bee keepers are to be congratulated on the excellent progress they have achieved in their departments.

Among the exports which has lost ground in the last fiscal year, sugar has already been referred to. Fiber has, we regret, diminished to the extent of \$982. This is surprising in view of the excellent quality of Hawaiian grown sisal and we hope in another year to see the old figures again attained. At present there is only one plantation exclusively engaged in sisal production, but there are several smaller growers who will no doubt be soon marketing their produce which will help to redeem the situation. Another item, akin in nature to fiber and which has also depreciated in the amount of its export, is that designated as "straw and palm leaf manufactures." Although the value of these for 1905 was insignificant, viz: \$747, yet this could not be maintained last year and fell to \$559. During the same period our importation of straw and palm leaf manufacturers increased \$7,864 in value and made the imposing total of \$28,864. There seems to be a good field indicated here for the establishment of a factory for the manufacture of articles made from palm-leaf, straw and similar products.

Of imports from the mainland during the past two years, the following items are quoted as affecting more nearly the question of our home industries:

Articles	1905	1906
Breadstuffs, animal feed, etc.....	\$202,337	\$243,588
Cocoa, etc.	9,541	10,788
Coffee	13,431	11,029
Eggs	14,925	12,995
Fruits and nuts	147,300	138,495
Hay	143,420	132,123

Provisions, comprising meat and dairy pro-

duce	524,372	587,334
Rice	303,029	164,863
Salt	7,104	6,034
Tobacco, manufactures of	528,373	494,818
Vinegar	5,241	5,886

While Hawaii will never be able to exclude certain commodities from her list of imports, a full development of her agricultural resources should materially diminish some of the above totals. This appears particularly true of the items enumerated above as Cocoa, Coffee, Eggs and Vinegar. Although certain proprietary brands of cocoa may be preferred and probably account for the value of this import, there appears to be little reason why this article is not grown here and does not even figure on our exports. The production of vinegar from bananas and other articles is a profitable operation and should repay experiment. The large importations under fruits and nuts would seem unnecessary in a country whose climate and soil is particularly adapted to fruit culture. Although much of the imported California fruit, such as apples, pears and plums, could not be produced here, yet the islands should not depend upon other countries for their orange supply. The paucity of Hawaiian grown oranges in the market is remarkable in view of their excellent quality.

The interest which is now being diverted to Hawaiian grown tobacco, makes the value of the importations of this article noteworthy. With an annual local consumption of half a million dollars worth of tobacco, growers of the local leaf should find a home market for their produce to the value of at least one hundred thousand dollars. A valuable export trade would no doubt also attend the production of a cigar possessing superior and characteristic qualities.

Taken as a whole the statistics which are to hand show a marked development of our island industries and indicate that in the near future a greatly increased production will be attained. With sisal and canned fruits already taking a place among our exports, and with rubber, tobacco and fresh fruits promising to establish themselves in the near future, the material prosperity of an increasing number of small producers will be advanced to the immense benefit of the Territory.

The report of the British Consul at San Juan, Porto Rico, upon the trade and industry of the island during the past year, has recently been issued. The most important development of the year has been made in the sugar industry which has been stimulated by the free market of the United States. Much capital is being attracted and many new plantations are in process of construction. The average sugar production is about two tons per acre, which could be greatly increased by fertilization and modern methods of cultivation and extraction. The total value of sugar exported, including molasses, was valued at \$13,433,000, an increase of nearly four million dollars.

About 7,000 acres are devoted to citrus cultivation, seventy per cent. of which is planted in oranges, twenty-five with grape fruit and five with lemons. Few of the citrus plantations have arrived at full yield, but the fruit is of good quality and has obtained high prices in New York. The freight on a box of oranges to New York is about 28 cents, as compared with 72 cents from Florida and 98 from California. Cuba pays 35 cents freight in addition to 56 cents duty per box.

The tobacco industry is rapidly improving the quality of its production. The main crop is exported as cigars to the United States and the inferior grades as raw tobacco to Germany and the Netherlands.

The coffee production showed little advance on last year's depression. Before the great hurricane in 1899 coffee was the principal product of Porto Rico. In 1896 the crop was valued at nearly eight million dollars, while in 1905 it amounted to approximately two millions.

Canning factories are working successfully in two parts of the island and more will be erected as soon as a good supply of fruit is assured.

One of the most important achievements of the Hawaii Agricultural Experiment Station during the past year has been the mission of Mr. J. E. Higgins with a consignment of Hawaiian fruit to the mainland market. Hitherto the exportations of island fruit have consisted almost exclusively of bananas and pineapples. This has been due to several reasons, chief among which are that for these fruits there already exists a demand upon the coast, and also that they are more easily

shipped than many of our equally delicious but more perishable varieties. It has long been desirable to introduce such island fruits as the papaia and avocado pear to the western markets and the chief deterrent to shipments has been the presumption that such fruit could not be subjected to a long sea transit without great deterioration in quality. In order to put this to the test the local Agricultural Experiment Station commissioned Mr Higgins to make a trial shipment of these and other fruits for which it may be desirable to create a market. The result has been very encouraging and the fruit has arrived at its destination in excellent condition. The station is investigating the best methods of packing the fruit and also is determining whether cold storage or exposure to the air on deck is to be preferred. There is little doubt that as soon as the avocado pear and papaia are introduced to mainland consumers the growers of these fruits will find a ready market for all their crop.

The total importations of domestic merchandise to Hawaii during the fiscal year ending June 30, 1906, amount to \$11,771,155, an increase over 1905 of \$127,636. The importation of foreign merchandise to Hawaii during the same year amounted to \$3,275,242, an increase over the former fiscal year of \$260,278. Japan heads the list in the value of direct importation to Hawaii from foreign countries with \$1,247,470 worth of merchandise, an increase over 1905 of about a quarter of a million. Our large Japanese population accounts for the quantity of Japanese commodities consumed in the islands. Chile is second on the list with \$448,608 to her credit, an amount which is almost identical with her figure for 1905. The United Kingdom occupies third place, having sold us merchandise to the value of \$424,976 in the last year, an increase of about \$120,000. Germany has been dispossessed of second place and now comes fourth, supplying us with \$171,497 worth of goods in 1906 as against \$544,534 worth in 1905. British India increased her supplies to \$408,607 from \$345,275 of the year before. Australia occupies next place with \$262,594, having almost doubled her figures in the year. Hongkong and Canada have also both materially increased their shipments which, for the year in question, were valued at \$245,244 and \$22,500 respectively.

Instructions for propagating rubber trees have recently been issued by the Forestry Department of the Board of Agriculture and Forestry. The department has recently secured supplies of fresh Ceara rubber seeds and is distributing them to anyone who will undertake to plant them and report to the Board the results they obtain. At Nahiku, on Maui, Ceara rubber trees have attained sixteen feet growth within a year and it is desirous of experimenting in other localities in order to ascertain under what conditions in Hawaii the Ceara grows best. In its natural habitat, and in those localities in which it has been cultivated with success, the tree has been subjected to a moderately dry climate. It is therefore remarkable that such a rapid development should have been attained at Nahiku where the rainfall is excessive. It is hoped that the offer of the Board of Forestry will be widely responded to in order that the best rubber growing districts may be ascertained.

By an agreement with Mr. H. P. Baldwin, representing the large planting companies of central Maui, a large tract of private land comprising over forty thousand acres has been placed for a period of seventeen years under the administration of the Board of Agriculture and Forestry. The government will maintain the land in question together with its own portion of the watershed of the northern side of Maui, as a forest reserve, certain privileges of commercial use under the direction of the Superintendent of Forestry being conceded the grantees.

Instructions have recently been received from the Lighthouse Board of Washington directing the immediate draughting of plans for a lighthouse at Makapuu. Sixty thousand dollars was appropriated for this purpose during the recent congressional session. It is expected that the new light will be a revolving one erected 150 feet above sea level. Such a light is visible thirty miles at sea and its maintenance will require the services of three men.

BOOK REVIEW.

Practical Forestry, For Beginners in Forestry, Agricultural Students, Woodland Owners, and Others Desiring a General Knowledge of the Nature of the Art, by John Gifford, Assistant Professor of Forestry, New York State College of Forestry, Cornell University. Illustrated. New York. D. Appleton & Company.

The aim of the author of the above book has been to include those parts of the science and art of forestry, which are of interest and importance to the general reader and beginner. In this he has been successful and the subject is reviewed in an untechnical and popular, yet accurate manner. The book seems well adapted for use, in conjunction with commercial and physical geography, as a text book in educational institutions offering a forestry course.

It is to be regretted that in the past the art of forestry has in many countries not been appreciated at its full significance. It has not generally been understood that in the preservation of forest areas lies one of the most important resources of a country. If properly maintained this resource is a living and perpetual one, of more lasting benefit than that derived from mineral wealth which in time must become exhausted. The successful application of the rules of forestry insures to a nation the maintenance of many industries upon which it depends for its welfare and prosperity. The importance of this is fully shown in *Practical Forestry*. The introductory chapters are devoted to a definition of the subject and to such technical terms as are necessary to the general reader. The various functions of the forest as an agent in modifying the surface of the earth and in affording a protection to the destructive forces of nature are then dealt with at some length, as is also their importance in the formation and improvement of the soil and in the conservation of moisture.

The second part of the book treats of the creation, preservation and development of forest areas. In this connection the adaptability of certain species to environment is discussed together with their propagation and economic value.

In part three will perhaps be found the most interesting section of the book. The descriptions of such forest industries as

lumbering and the destructive distillation of wood, and the processes of manufactures of wood pulp, cellulose, maple sugar, resin, turpentine and tan bark, afford a mass of readable and important information. The chapter on the forest trees and products of the tropics is doubtly interesting to Hawaiian readers and we would gladly have seen this department of the book greatly increased. While from a botanical and scientific point of view and also from that of the application of forestry methods the book affords a valuable store of accurate information, it is evident that the author's knowledge of tropical agriculture is not so well grounded as that which he possesses of the forestry conditions in more northern countries. One or two references to the Hawaiian Islands are somewhat misleading, as for instance the statement relating to the export of candle-nut oil from the "Sandwich Islands."

Apart from one or two inaccuracies of a like description, which in no way detract from the value of the work in its utility to forestry students and which may be looked for in the compilation of numerous facts embracing a knowledge of many countries, the book is to be commended for its scope and practical utility. It concludes with a list of fifty important American forest trees, twenty-five of which are conifers and twenty-five hardwoods. To each species a general description is given together with its economic use and method of propagation. A comprehensive index adds greatly to the usefulness of the work.

All who are attracted by a most interesting subject and who do not wish to be oppressed by a multitude of burdensome technical terms will derive much enjoyment and information in the perusal of *Practical Forestry*.

MASTIC FOR LIMING RESERVOIRS.

The mastic recommended by the Texas Experiment Station for liming reservoirs and irrigation ditches is as follows:

An even slope of 45 degrees is given to the walls and a coat of mastic applied throughout to a thickness of one-half inch over the inner side of the walls and on the bottom of the reservoir. The mastic is applied at the rate of 52 pounds per square yard

surface. It is comprised of 25% coal tar, 73% sand and 2% lime. Before mixing these materials, a part of the coal tar is boiled for a short time and then burned off or flashed, to cause it to set or "pitch" when the material cools. All of the materials should be hot when mixed, and the mastic should be applied hot to the ground surface, beginning at the bottom and working up. A few days after the mastic has been applied and it has had time to harden, a coat of flashed coal tar is applied to the mastic, which when dry gives a glazed impervious coat, resting on an elastic foundation.

It is important when using this mastic on filled earth such as the inner face of an earthen dam, to permit the dirt to become thoroughly compacted and settled before the application.

At the Texas Experiment Station a reservoir 8 feet deep, 28 by 48 at the bottom and 44 by 64 feet at the top, was constructed for \$105, including the cost of labor and material. Experiments made with asphalt instead of coal tar were unsatisfactory.

JARED G. SMITH,

Special Agent in Charge of the Hawaii Experiment Station.

FARMERS' BULLETINS.

The following new Farmers' Bulletins have been issued by the U. S. Department of Agriculture. They may be obtained free on application to the Secretary of Agriculture, Washington, D. C.

No. 261. *The Cattle Tick in Its Relation to Southern Agriculture.* By August Mayer, Shreveport, La. Pp. 24.

This bulletin describes the effect of the tick on cattle, its injury to the cattle industry in the South, the necessity for its eradication, and the benefits that would follow.

No. 262. *Experiment Station Work—XXXVI.* Compiled from the publications of the agricultural experiment stations. Pp. 32, figs. 2.

Contents: Water for table use; Phosphates; winter wheat; glutenous and starchy wheat; dry farming; methods of canning; beet molasses and pulp; feed lots; guinea fowls; color of eggs; spraying for scale insects; white pine in New England.

No. 265. *Game Laws for 1906.* By T. S. Palmer and R. W. Williams, Jr., Assistants, Biological Survey. Pp. 56, figs. 4.

A summary of the provisions relating to seasons, shipments, sale, and licenses.

FOREST SERVICE.

(From the Year-book of the U. S. Department of Agriculture,
Report of the Secretary.)

During the past year the Government work in forestry entered upon a new phase. Practical work in the actual introduction of forestry began in 1898, but it was not until February, 1905, when the care of the National forest reserves was transferred to the Department of Agriculture, that the Forest Service became an administrative organization.

This transfer was a logical outcome of the recent work of the Service. During the last six or seven years it has passed through a remarkable development, which has followed but not kept pace with its demonstration of capacity for public usefulness. On July 1, 1898, the Division of Forestry employed eleven persons, of whom six filled clerical or other subordinate positions, and five belonged to the scientific staff. Of the latter, two were professional foresters. The Division possessed no field equipment; practically all of its work was office work.

At the opening of the present fiscal year the employees of the Forest Service numbered 821, of whom 153 were professional trained foresters. Field work was going on in 27 States and Territories, from the Atlantic to the Pacific and from Canada, to Mexico. Over 900,000 acres of private forest were under management recommended by the Service, and applications on file for advice from owners contemplating management covered 2,000,000 acres more. During the year nearly 62,000 letters were sent out from the offices at Washington, the majority of them in reply to requests for information and advice from the public, of a kind which could not be met by printed information.

This contrast imperfectly indicates the full extent of the change which has taken place, and the progress which has been made. Seven years ago there were in the whole United States less than ten professional foresters. Neither a science nor a literature of American forestry was in existence, nor could an education in the subject be obtained in this country.

The real need of forestry was urgent. A time had come which presented at once a great opportunity and a dangerous crisis. Forest destruction had reached a point where sagacious

men—most of all, sagacious lumbermen—could plainly discern the not distant end. The lumber industry, vital to the Nation at large, was rushing to its own extinction, yet with no avenue of escape apparent until forest management for future crops should be forced by famine prices. Meanwhile, however, the ruin would have been wrought already.

Timber-land owners were selling their holdings or their stumpage with little evidence of an understanding of their future value, and lumbermen were compelled by business competition to keep down the cost of operation to the lowest terms or market their product at a loss.

Forestry was both an evident economic need and an apparent economic impossibility. Few well-informed persons believed that the obstacles to its introduction could be overcome sufficiently to bring it into common practice among private owners during the lives of the present generation.

That the whole situation is profoundly altered is directly and chiefly due to the work of the Forest Service. With its offer of practical assistance to forest owners made in the fall of 1898, its field of action shifted from the desk to the woods. The lumberman was met on his own ground. Uncertain speculations were converted into business propositions and untried theories into practical rules. Actual management for purely commercial ends has been taken up and applied on their own holdings by some of the best known lumbermen in the country. What lumbermen as a body now think of forestry is illustrated by the recent effective movement in their National association to endow a chair of lumbering at one of the forest schools.

Forestry is a matter of immediate interest to every household in the land. Forest destruction is no imaginary danger of a distant future. If it is not speedily checked its effects will sooner or later be felt in every industry and every home. To make these facts known is a National duty. The work of education must continue until public opinion will not tolerate heedless waste or injudicious laws.

PRESENT STANDING OF FORESTRY.

The period which has passed since 1898 has been, in forest work, a period of large definite accomplishments and of effective preparation for the future. Of the exact knowledge con-

cerning our American forests, upon which the practice of scientific forestry depends, vastly more has been gathered during the last seven years than previously from the time Columbus landed. In 1898 the Division of Forestry had hardly approached the specific problems of forest management in the United States, and had developed no efficient methods of attacking them. The records now on file are based on the measurements of millions of individual trees. Commercial tree studies looking toward management have been prosecuted for 32 important species. Working plans have been prepared in 28 States, and field work has been conducted in every State and Territory in the United States, and in Porto Rico, Alaska, and the Philippines.

The scientific knowledge gathered in the field has taken form in a rapidly growing literature of the subject, and has furnished the basis for a system of professional education. Today there is scarcely more occasion for the American to go abroad to study forestry than to study medicine or law.

Besides creating a science of American forestry, the Forest Service has worked out the methods of operation by which forestry may be put in practice. It found in existence a fully developed system of lumbering, which had brought efficiency and economy of labor to the highest point, but was often wasteful of material and regarded forests as simply so much standing timber to be cut. Men taught to regard cheap logs at the mill as the supreme test and sole end of good lumbering, justly proud of their proficiency in a highly specialized industry, and impatient of restraint, could not be expected to welcome with cordiality changes for a purpose whose utility they were necessarily slow to recognize. To work a reform it was necessary to begin with existing conditions and improve them instead of criticising them. Had not the Forest Service taken the lead in finding out just how practical rules for conservative lumbering might be laid down and carried out forestry could not have reached the point at which it now stands in the United States.

In the field of economic tree planting the same story is repeated and shows definite, important, and permanent results. It is true that in 1898 farmers throughout the Middle West, where tree planting finds its largest field of economic usefulness, were already alive to their need of planted timber. But

the knowledge of what kinds of trees to plant and how to make them grow was imperfect. These were the fundamental problems: (1) The comparative adaptability of various species to regional and local conditions of climate, soil, and moisture; (2) the comparative usefulness of the species which can be made to thrive; (3) the protective benefits of planted timber; and, (4) the rate of growth and the future yield which can be expected.

Substantial progress toward the solution of all of these problems has been accomplished. The Forest Service has made in all 300 separate planting plans for private owners, covering an aggregate area of over 50,000 acres, in 36 States and Territories. It has completed regional studies of the broad conditions in the New England States, California, Kansas, Nebraska, Iowa, eastern South Dakota, western Minnesota, Illinois, Oklahoma, and the Ohio Basin in Ohio, Pennsylvania, and West Virginia. These studies largely supersede the necessity of future individual studies on the ground. It is now in a position to exercise great helpfulness in the whole planting movement throughout the United States. It has established in the minds of western farmers generally the fact that tree planting can be made successful and that it adds to the money value of their farms. It has also called attention to the great hygienic importance of tree planting on the watersheds; of public water supplies of cities, east and west; has developed practical methods for reforestation denuded mountain slopes and for establishing new forest growth in regions of little rainfall, and has powerfully contributed to the great work of reclaiming desert lands through water conservation and to the whole irrigation movement.

THE GAIN IN ECONOMY OF USE.

The Forest Service has in the last seven years added greatly to our visible forest resources. In the saving of waste it has enriched the country by many millions of dollars, and in this way alone has added vastly more to the National wealth than its total expenditures for all purposes during its entire history.

Its most important achievements in decreasing the drain upon our forests by providing for their more effective utilization have been along four lines—determination of the strength

of different kinds of timber, studies of methods by which timber may be made more durable, efforts to decrease waste in lumbering, and the discovery and introduction of better methods of gathering forest products other than lumber.

By its timber tests the Forest Service has established the suitability of various little-used but abundant woods, especially for structural uses, and has made possible the more economical use of other woods by an exact determination of their strength. By its studies of the effects of seasoning and the value of different methods of preservative treatment, it has opened the way to an enormous reduction in the drain upon our forests for railroad ties. What this demand at present is may be realized when it is considered that if a tree were growing at each end of every railroad tie laid in the track in the whole United States all the timber produced would be needed for renewal alone. In other words, two trees must always be growing in the forest to keep one tie permanently in the track.

By its studies of lumbering methods the Forest Service has shown lumbermen how timber formerly wasted in high stumps, tops, and logs left in the woods could be utilized without added expense. And a not less serious waste of a great resource was cut off when the invention of a new method of turpentine made it possible to eliminate the destruction of our southern forests through boxing the trees, and at the same time to gather a far larger value in turpentine than before.

FOREST EXPLORATION.

Finally, the Forest Service has rendered a great service by its explorations of forested regions. Useful contributions to the knowledge of our forest resources have been made through specific studies of important regions. The guiding principle of this policy is, of course, that all land should be put to its best use. This principle the Forest Service has assisted to put into effect by its recommendations as to what lands should not as well as what should be reserved.

RESERVE ADMINISTRATION BY THE FOREST SERVICE.

The forest Service had become fully qualified, by its past work, for the responsibility laid upon it by the transfer of the reserve to its administrative charge. The immediate effect of

the change was the opening of the reserves to much wider use than ever before. This is the natural consequence of intrusting the care of these great forests to the only branch of the Government which has the necessary technical knowledge. The inevitable consequence of a lack of such knowledge must be the restriction of right use or the practical certainty of misuse. Only under expert control can any property yield its best return to the owner, who in this case is the people of the United States.

Under the system of administration now in force everything affecting the reserves is determined or executed by men of expert knowledge, familiar with local conditions. This entire force has become a part of the classified civil service. Timber is cut only under the supervision of trained men in accordance with a plan carefully prepared to safeguard the permanent welfare of the forest; yet the sales of timber have many times increased since the Forest Service took charge. A far more complete control is exercised than formerly, yet the net cost to the Government of all the work of the Service will be less for the present year than that of the Bureau of Forestry alone before the transfer. A property worth in cash not less than \$250,000,000 is administered at a cost of less than one-third of 1 per cent. of its value, while increase in that value of not less than 10 per cent. per annum is taking place. As the use of the reserves increases the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The forest reserves are certain to become not only self-supporting but a source of large public revenue.

WORK OF THE YEAR.

The transfer of the National forest reserves to the care of the Department of Agriculture was effected on February 1, 1905. The administration of these vast forests fell quietly into its place in the Service, and has since been conducted with steadily advancing efficiency. Every office in the Forest Service is actively concerned in their management, working and planting plans are in preparation and have been prepared for various parts of them, and they are absorbing and will continue to absorb a greater and greater part of the work of the Forest Service.

FOREST MANAGEMENT.

Public Lands.

On the public lands greater strides were made in the introduction of forest management than ever before. Wherever on the reserves timber is in present demand working plans are being prepared which will insure the best use of the forests. On the Chippewa Indian Reservation, in Minnesota, the complete success of the plan to secure the perpetuation of the forests is assured. In California, Colorado, Montana, South Dakota, and Wyoming studies of leading commercial trees have provided a basis for the intelligent management of the forests in which these trees hold an important place, including many of the reserve forests.

Private Lands.

The movement to introduce forest management on private lands is spreading rapidly, especially in the Pacific Coast States and the Middle West. Nearly four-fifths of the applicants for coöperative assistance were small owners. The total area for which assistance was asked was nearly 1,500,000 acres. Examinations to determine the practicability of management were made of 22 large timber tracts in 15 States, and detailed working plans were made for 8 large and 81 small tracts, with a total area of almost 2,000,000 acres.

FOREST EXTENSION

Up to the present year the work in extension found altogether its largest field of usefulness in the preparation of planting plans for farm protection and local timber supply in the scantily timbered regions of the Middle West. It is certain that tree planting will always hold an important place in farm economy, but it is more and more becoming possible to supply the needed information for this work from the central office as a result of regional studies. The large projects involved in the establishing or replacing of forests on reserve lands now unforested, and in demonstrating to the consumers of timber that they must provide for their future needs, will probably for the next few years increasingly claim the attention of the Forest Service.

During the year a revision of the terms of coöperative assistance was made to induce wider acceptance by small owners. Up to the present time 380 planting plans have been made, of which 49 were made during the past year.

Reserve planting during the year included the establishment of nurseries in the Santa Barbara and Gila River reserves, broadcast sowing and field planting on the Black Hills Reserve, and field planting in the San Gabriel and Dismal River reserves, besides the extension of previously established nurseries. The experiment in broadcast sowing in the Black Hills is especially notable, because the results obtained now appear to be entirely favorable and because success has never before been gained under this method in this country. The significance of this fact lies in the enormous difference in the cost of reforestation by sowing seed on ground not previously prepared and of rearing and transplanting nursery stock for large areas.

By the completion of the coöperative study conducted in the State of California valuable information was secured concerning the relation of chaparral to water conservation and forest renewal and concerning fire protection.

FOREST PRODUCTS.

Lines of coöperative work now completed have brought definite and important results in introducing preservative treatment as a means of increasing the durability of ties, and thereby decreasing the drain upon the forests. The results give good reason for the belief that tie preservation will shortly become practically universal.

The study of the preservation of telegraph and telephone poles promises further economies of the same kind.

In timber tests, studies of red gum, red fir, western hemlock, and loblolly and longleaf pine have furnished facts which will lead to the wiser use of these species and of structural timber generally. Strength tests of woods for other purposes have been begun, and methods have been prepared for the more extensive prosecution of this very practical work; but the full utilization of the opportunity presented for public usefulness must wait until the necessary facilities are provided.

Progress was made during the year in the general study of forest distribution, classification, and composition throughout the United States, especially through regional studies. Previous studies of basket willows and turpentine methods have been continued with further helpful results.

NOTICE.

The next regular meeting of the Farmers' Institute of Hawaii will be held at the Library of the Territorial Board of Agriculture and Forestry on King street, Honolulu, Saturday, September 29, at 7:30 p. m.

This is the last meeting of the year and is to be made an important occasion in the interest of Hawaii's agriculture; the fascinating subject of Hawaiian fruits and the possibilities of tropical fruit-culture in these Islands is to be presented by able speakers, and cannot fail to arouse interest in this neglected, but very important island resource.

The program will be as follows:

"Fruit Culture as an Industry in Hawaii," President Jared G. Smith.

"Hawaiian Fruits," Dr. William T. Brigham.

"Tropical Fruits as Food," Dr. Edmund C. Shorey.

"Horticultural Insect Enemies, (exhibition of specimens,)" Mr. D. L. Van Dine.

A cordial invitation is extended to all who are interested.

(Signed) F. G. KRAUSS,
Secretary.

STREET IMPROVEMENT.

Pensacola street will, in a few years, be one of the most beautiful in the city. Through the generosity of Mrs. Wilder the thoroughfare has been planted on both sides with golden shower trees.

MISCELLANEOUS NOTES.

HEREDITY IN STOCK.

Any phenomenal traits, but more especially that of milk, appear to be obtained far more through the bull than the cow, hence so many of our short-pedigreed or non-pedigreed cows and heifers are daily proving better dairy cattle than those of long standing pedigree. There is undoubtedly in the case of heavy milkers a tendency to weaken the constitution of the cow, both as regards health and also as regards the ability to impress the offspring. These cows, it is quite possible, indeed, it appears to be the case, give more effect to their male offspring than to the female, as bulls from such animals quite as a rule beget much better milkers than the bulls from cows of light milking properties.—*Journal of the Jamaica Agricultural Society.*

DAIRY INSPECTORS.

The first examination for the appointment of supervisors under the Milk and Dairy Supervision Act has just been completed. Two hundred and sixty candidates presented themselves for examination and 22 passed. The examination was divided into three parts—written, oral and practical, but no candidate was rejected on the written paper alone. The examiners required first, practical experience; second, general education; and third, sound common sense and tact, with a knowledge of the underlying principles of agriculture—men who could not only do a thing, but who could say why they did it, and who were able to explain their reasons lucidly to a farmer. Of the 22 successful candidates, 10 were dairy farmers, 5 factory managers, 3 veterinary surgeons, 1 an analyst, 1 a shire inspector, 1 an inspector of the Agricultural Department and 1 a dairy hand. They ranged in age from 20 to 44.—*Journal of Department of Agriculture, Victoria.*

THE SCOTIA FIRE BEATER.

Those who have had experience in subduing fierce bush fires know what exhausting work it is to stop a fire when it is assisted by a high wind, and how difficult it is to beat it down in high grass with the usual implements—green bushes or gunny

and flour bags. A very capital contrivance has been invented for the purpose by Mr. John Wilson of Brisbane. It consists of a handle 3 feet 6 inches long, 1 1-8 inches round, at the end of which is a knob, conical in shape, made of red gum. A sheep-skin basil, having a hole in the center, is slipped over the handle and is secured from coming off by the gum knob. A chafering piece is provided inside and outside of the basil to prevent friction and the three pieces are firmly rivetted together. Over the top of the handle a metal socket is passed, which keeps the whole in position, and is secured by a screw. One of the best points of the invention is the admirably adjusted weight of the socket, which enables a firm downward effective blow to be given when dealing with cane or heavy grass. There is nothing like leather!—*Queensland Agricultural Journal*.

IMPROVEMENT OF PASTURES.

In a recent address by Professor Angus, he deplored the little attention given to the improvement of grazing land. Year after year they were impoverishing the land by feeding, and they gave nothing in return. He explained at length the best manures to use for improving grazing lands, and the methods of using them. Even poor land, if broken up, drained and properly treated, could be made to yield good pasturage. He emphasized the necessity of lime dressing land to sweeten the herbage and to get rid of mouldy conditions. As manures for grazing land he favored Thomas phosphate or basic slag and bones.—*Journal of Agriculture of South Australia*.

POULTRY MANURE.

The most valuable of all animal manure is poultry droppings. It is most useful just where it is most needed—the vegetable garden. The poultry of Jamaica could produce value to the extent of many thousand pounds of manure if it were all saved. But how few people house their poultry as night? Fresh earth should be put beneath the roosts every day—(five minutes is enough time to clear the place up every morning) and the manure should be put in a barrel under cover till the barrel is nearly full, when it should be applied to the garden.—*Journal of the Jamaica Agricultural Society*.

THE WORLD'S RUBBER CROP.

The total annual production of rubber throughout the world was 57,000 tons. Of this total 55 per cent. came from South America and Africa. The French possessions on the West Coast of Africa produced 7,000 tons, the French Congo 3,000 tons, while the output of the Belgian Congo does not exceed 6,000, notwithstanding popular opinion to the contrary. The United States consumes 26,470 tons, Germany 12,800 tons, Great Britain 10,000 tons, France 4,130 tons, Austria-Hungary 1,520, Holland 1,218, Belgium 7,480 and Italy 588 tons.—*Jamaica Agricultural Society*.

GINGER.

According to Gillespie Bros. & Co.'s New York Market Report for March 16, ginger continues to be the principal factor in the spice market. The continued upward movement of the market and the situation in Jamaica, make it almost impossible to attempt to predict what price Jamaica root will reach, or even to name quotations. London has advanced 2 shillings per cwt. within the past fortnight and buyers have advanced their offers 1 cent per lb., but were unable to obtain any ginger even at this advance.—*Bulletin, Department of Agriculture, Jamaica*.

POTATO MANUFACTURES IN GERMANY.

No less than 2,000,000 tons of potatoes are used in Germany in distilling spirits, the residue from the distillation operation being used as a cattle food, besides another 2,000,000 tons annually are used in the production of starch, and in addition there is manufactured from the potato,—syrup, flour, dextrin, etc.—*Jamaica Agricultural Society*.

SILK WORMS AND WASPS.

In experiments with silk worms, recently conducted in Jamaica, it was found that the common wasp (*Polista*, sp.) proved their most formidable enemy. It killed and devoured the caterpillars whenever they approached too closely to the netting where they were confined.

At a competition inaugurated by the government of South Australia in 1890, in which prizes to the value of \$750 were offered for machines for gathering stones and stumps lying loosely on the surface, only one machine was forthcoming. A field had previously been prepared to test competing machines, and a liberal supply of stones had been carefully strewn. The solitary competitor proved a failure and the owner of the field had the doubtful satisfaction of gathering up the stones again by hand.

A Guernsey cow belonging to Mr. Riethrock of Athens, Wis., holds the world's record for butter production. The cow is nine and a half years old, and during the year commencing October, 1904, she yielded 14,920.8 pounds of milk, containing 857.15 pounds of butter fat, equivalent to 1,000 pounds of butter.

The world's cocoa crop in 1903 was 125,895 tons, which increased in 1904 to 146,552 tons.

RUBBER PRODUCTION.

The total acreage of rubber plantations in Asiatic countries at present is approximately as follows:

	Acres
The Straits and Malay States.....	30,000
Sumatra	5,000
Java	5,000
Ceylon	25,000
India and Borneo.....	5,000
Total	70,000

This acreage will be in full bearing in 1911.

Allowing a yield of 200 pounds per acre, 14,000,000 pounds of rubber will be produced by the above countries in 1911.

The world's production of rubber in 1898 was about 134,000,000 pounds.

The present production is about 156,000,000 pounds.

RECENT PUBLICATIONS.

Report on Agricultural Investigations in Hawaii, 1905, by Jared G. Smith. U. S. Department of Agriculture, Office of Experiment Stations, Bulletin No. 170. This publication is a resume of the principal work during 1905 of the Hawaii Experiment Station. During the year important work has been conducted in ascertaining the value of the black-wattle in Hawaii as a source of tan-bark. The results of these investigations have already been published by the station in Bulletin No. 11. The trees available covered about six acres, growing on the station grounds at an elevation of about 700 feet. About 36 tons of dry bark were obtained, averaging in value \$23.31 per ton. A yield of 6 tons of bark may be considered very low, but the small crop is attributed to causes which can easily be obviated. It is believed that wattle cultivation would prove extremely profitable if a sufficient acreage were planted to enable the owner to market a definite amount of tan-bark every year after the plantation has reached maturity.

Perhaps the most important field work of the year has been achieved in tobacco growing experiments. The station is to be congratulated upon the valuable results it has obtained in this direction which will no doubt have a far reaching effect upon the future agricultural development of the Territory. Even though the Hawaiaian crop must be marketed in open competition with Cuban and Sumatran leaf there is a sure success for certain types of tobacco which the experiments have shown to be suitable for growth in the islands.

Probably the new industry which is attracting most attention in Hawaii today is the cultivation of rubber. The outlook for this is particularly promising. The conditions in Hawaii are believed to be extremely favorable for the cultivation of Ceara rubber trees and one of the newly formed companies has already planted 100,000 seeds of this species and expects to have half a million trees growing within two years.

The cultivation of cassava for the production of starch has also been carefully investigated during the year and important data has been secured.

During the year the following publications have been issued:

Bulletin No. 8.—Methods of Milking.

Bulletin No. 9.—Citrus Fruits in Hawaii.

Bulletin No. 10.—Insect Enemies of Tobacco in Hawaii.

Press Bulletin No. 11.—The Common Liver Fluke in Hawaii.

Press Bulletin No. 12.—Tobacco in Hawaii.

Press Bulletin No. 13.—Rubber in Hawaii.

Press Bulletin No. 14.—Fuller's Rose Beetle.*

The report of the chemist occupies many pages of matter, which although uninteresting to the ordinary reader, is extremely important in its bearing upon the industries of the Territory. During the year important analyses have been made of island fodder. Many samples of soil have been analysed to determine their suitability to various crops, and also samples of honey, guava jelly, wattle bark, granulated sugar, condensed milk and canned pineapples have been analysed chiefly at the request of manufacturers who often desired information to overcome certain unfavorable conditions in their produce. In this connection the practical value of the chemical laboratory cannot be overestimated.

The report of the Entomologist deals mainly with the bee industry of Hawaii. A partial list of our chief honey producing plants is interesting. During the year the station has successfully introduced the Italian bee into the Philippines. Silk culture has occupied much attention during the year and good results has been achieved. Active work has also been done in the campaign against mosquitoes, not the least important step in this direction has been the introduction to Hawaii of mosquito-eating fish, an account of which has already appeared in the Forester. A partial list of injurious insects in Hawaii (part 2) and also a partial bibliography of Hawaiian Entomology make the Entomologist's report of special value.

The report of the Horticulturist shows much work has been accomplished to assist in the development of our resources. During the year important experimental shipments of island fruit have been made to the mainland, which have taught much as to the best means of placing island fruit in the coast market. Important reference is made to the litchi, mangosteen, wi, and various other horticultural products which should ere long find a place in the list of Hawaiian products.

* The "Maui" or "Olinda" Beetle.

The Mango Weevil, by D. L. Van Dine. Press Bulletin No. 17, Hawaiian Agricultural Experiment Station. As if not content with the innumerable insect pests with which our growers and entomologists have to combat, nature or rather ill chance has inflicted another unwelcome visitor upon us which now threatens the most important fruit food of the larger portion of the inhabitants of Hawaii. The intruder is known as the Mango Weevil and it belongs to the same family as the Cotton Boll-weevil which, since 1892, has destroyed \$50,000,000 worth of cotton in the southern United States. The injury inflicted on the mango is primarily the destruction of the seed and also blemishes in the appearance of the fruit. In view of the terribly destructive habits of the family of insects to which this weevil belongs, in looking for the future development of the mainland market and to prevent a prohibition of the export of Hawaiian mangoes, it is important that vigorous measures be undertaken to control the pest. The importance of achieving this may be gauged by the fact that the suggestion is even made in the bulletin to destroy for a period of two years all fruit in infected districts, and the excellent advice is given that all common varieties of mangoes be cut back for in-arching or grafting with finer qualities.

DISTRIBUTION OF RUBBER SEEDS.

The Forestry Department, Board of Agriculture and Forestry, has secured from several sources a fresh supply of Ceara rubber seeds, which are being distributed free, in small quantities, to anyone who will undertake to plant and care for them and report to the Board from time to time what the results achieved are.

The seeds are mailed to applicants together with instructions as to how to propagate and plant the trees.

Already about one hundred persons scattered throughout the Territory have applied for seeds. Each applicant is requested to sign a postal card agreeing to care for the trees and report thereon.

The object of the Board is to get the seeds planted in as many different localities, soils and climates as possible, so as

to ascertain just what can be done with the Ceara rubber throughout the Territory. All of the reports will be compiled and published for the information of the public.

The following is the form of agreement and instructions being sent out by the Board in connection with the seeds:

FORM OF AGREEMENT SIGNED BY APPLICANTS.

Board of Commissioners of
Agriculture and Forestry:

The undersigned hereby agrees to plant and care for seed or seedlings of Rubber trees furnished by the Division of Forestry for experimental purposes, and to occasionally report upon the condition and growth of the same, on blanks furnished for that purpose.

It is the intention of the undersigned to plant the seed or seedlings, on the land of.....
owned by, in the District
of, Island of
Elevation.....

Name

Address

Date:

INSTRUCTIONS FOR PROPAGATING THE CEARA RUBBER (MANIHOT GLAZIOVII).

The Ceara rubber seed has a very thick and hard coating, and natural process of germination occupies some months. The seed should be carefully rasped with a file or ground on both edges of the radicular end without injuring the embryo—the operation requires care. After this treatment, properly performed, the seed should be planted about two inches apart in seed box or bed using, if possible, good soil. If the soil is stiff, about one-half white sand ought to be added and thoroughly mixed. The seed should not be planted over half an inch deep.

PROTECTION FROM RATS IS ABSOLUTELY NECESSARY.

The soil ought to be kept moist and if planted in a box, five or six three-fourth inch holes ought to be bored in it for drain-

age. The seeds should begin to come up within two weeks, when it will be necessary to remove the pulps adhering to the primary leaves, if the weather is dry.

After the third leaf has developed the young plants should be transplanted. Great care ought to be taken to protect the roots from exposure and as much soil as possible remain intact about them. From nine to ten feet apart is considered about the right distance to plant in permanent position.

MAKING HOLES AND PREPARING THE SOIL.

This subject as well as the following one requires particular attention and a little extra labor in making a good hole and preparing the soil properly will pay in the long run.

In stiff or hard soil the holes should be made three feet square and from two and one-half to three feet deep; in free soil smaller holes will suffice.

As the top soil is generally the best it should be put to one side, so that it can be used around the roots of the tree when the hole is refilled. The soil should be well broken up and the turf, if any, should be put grass side down in the bottom of the hole.

PLANTING.

The hole should be filled to within two inches of the surface reserving the best soil to pack about the tree. The soil should be tramped lightly with the feet, after which a small hole should be made to receive the plant. The tree should be planted about one inch deeper than it was before, and the soil packed firmly around it.

CARE OF TREES AFTER PLANTING.

After planting the ordinary care generally given to economic trees will be sufficient.

FARMERS' INSTITUTE MEETING.

As announced the meeting of the Farmers' Institute took place at the Library of the Board of Agriculture on Saturday, September 29th. A full account will appear in the next issue of the Forester.

RABBIT EXTERMINATION.

In order to bring to a successful issue the method of exterminating rabbits advocated by Mr. Rodier, and which has for its motto, "Kill the females and let the males live," the natural law of "survival of the fittest" must come into operation, and it appears to have been accepted that when the males predominate and become the superior sex, the females necessarily become exterminated. There, however, exists a theory, accepted by some as a natural law, which tends to avert the extermination of a species by sexual preponderance, namely, the theory of "cross-heredity of sex," the doctrine of which is that the better nourished and superior parent tends to produce the opposite sex. This theory of "cross-heredity of sex" is strongly supported by the result of the test, for in pen No. 1, (which originally contained 9 does and 3 bucks) of the increase 15 were females and 9 males; in pen No. 2, (originally containing 6 of each sex) of the increase 21 were females and 4 males; in pen No. 3, (originally containing 8 does and 12 bucks) 11 were females and 5 males; in pen 4, (originally containing 4 does and 12 bucks) 7 were females and 4 males; in pen 6, (originally containing 11 does and 1 buck) 7 were females and none were males. Pen 5 was apparently not used for breeding.

The result of this test may be summarized as follows:

1. Preponderance of males tended to decrease the number of young.
2. The males, when in excess, did not generally worry the females to death.
3. The males did not worry each other to any great extent.

It would appear that Mr. Rodier's method resolves itself into a pertinacious effort to kill the last elusive doe.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 3 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

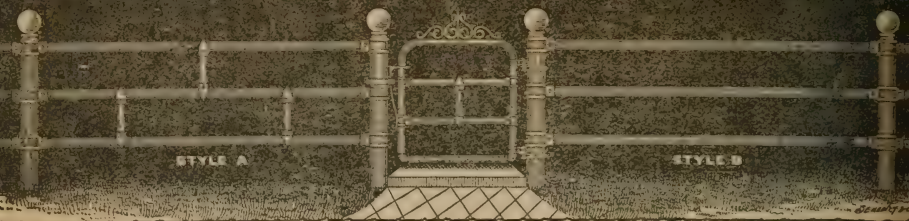
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

OCTOBER, 1906

No. 10

The event of greatest interest to Hawaiian agriculturists during the month just past was the meeting of the Farmers' Institute, of which a full account appears in the present issue. The secretary, Mr. Krauss, had arranged a very interesting program which attracted a full attendance. It had been arranged to make a special feature of island fruits and the whole of the evening's proceedings bore in some way upon this important subject. The fact which most prominently revealed itself in the course of the evening was that Hawaii is not doing sufficient justice to her fruit producing capacity, but is neglecting a most remunerative branch of agriculture which lies to her hands almost unheeded. It was shown that the Territory is far behind many similarly situated islands, in the matter of fruit production. The West Indian islands, for instance, offer in their markets an astonishing number of excellent fruits in prolific quantity, the greater number of which are known to the ordinary traveller only by name. A mainland visitor to the Honolulu markets is, however, as a rule disappointed by being confronted with a poor supply of perfectly familiar fruit, the greater proportion of which may have been imported from his own country. If perchance he should be favored by arriving here in the mango or avocado pear season he will be offered our island product indeed, but of a variety and quality which few old residents would essay. On such evidence as this tropical fruit is sometimes condemned by mainland visitors as being unpalatable, uninviting and often harmful.

It is extraordinary that the systematic production of high grade market fruit is not in full operation on all the islands. Probably no enterprise offers such a certain return to a large number of industrious men as does this. The subject is well worth the attention of those interested in building up in Hawaii a prosperous community of white settlers. A pamphlet circulated on the mainland descriptive of the promising future of fruit production in Hawaii and giving particulars of lands that could be acquired by

desirable settlers would well repay the cost of production. It is remarkable, however, in view of the situation that it is necessary to appeal outside for fruit growers. There should certainly be found among our present residents many who would be willing to plant small orchards of citrus and other fruits, if the enterprise were brought before them as a business proposition. The planting of five acres of select fruit trees now would, in a few years, provide the owner with a substantial income. The initial outlay of such an undertaking is small and its maintenance such that a man of moderate means could easily afford, in view of the prospective return. With a number of similar orchards established within touch of the Honolulu market the profitable growing of fruit would be one of the substantial factors of Hawaiian prosperity. The necessity of activity in this and other new agricultural operations is all the more urgent in view of the impending annexation of Cuba. Although the consummation of this event is probably many years distant, it is one that must necessarily unsettle the future of all industries dependent upon the sugar market. Now is the time for Hawaii to insure herself against any adverse future contingency of this kind. Every acre of land planted now by small holders and rendered productive, makes this Territory so much the more independent of other countries. With flourishing orange, lemon and lime orchards, plantations of pineapples, rubber and tobacco the day may yet come when Hawaii may view with comparative unconcern the contemplated absorption of other lands by the parent country. We believe that the home demand for select fruit, and the indicated future of the world's rubber and tobacco consumption, warrant the taking up in the Hawaiian Islands of all available land for the production of these commodities. Already signs are not wanting that in a very short time much expansion will be made on the lines we have suggested. The colony of Wahiawa has long proved the wisdom of its founding and is rapidly advancing in prosperity. In a short time there is no doubt that many of its pioneers will be comparatively wealthy men. The advancement of their individual circumstances will be much to the benefit of Hawaii, but greater than all this to the public welfare will be the enhanced taxation return to the public coffers from rich and valuable lands, the foundation of a contented, prosperous and enlightened white population, and the establishment of many minor agricultural industries upon a profitable financial basis. The Palolo settlers are already giving indi-

cations of following in the successful wake of their Wahiawa brethren, and small plantations of flourishing rubber and fruit trees are rapidly springing into existence. With the success achieved in these two instances we hope that the Government will be encouraged to open other fertile lands for settlement. The time for such beneficent action is the present, when cultivation commenced now will be remunerative in five years.

We are gratified to be able to present to our readers the paper read by Dr. William T. Brigham at the recent meeting of the Farmers' Institute. The information therein contained will be of permanent value as a record of the fruit trees which have already been established here, and will lay the foundation of all future works upon our island fruits.

FARMERS' INSTITUTE MEETING.

The regular quarterly meeting of the Farmers' Institute of Hawaii was held in the Library of the Bureau of Forestry, on King street, on Saturday, September 29th. The chair was taken by Mr. Jared Smith, and after the reading of the minutes of the previous meeting the following paper was presented:

FRUITS FOR THE HAWAIIAN ISLANDS.

BY DR. WILLIAM T. BRIGHAM.

My intention in this paper is to mention briefly some of the tropical and sub-tropical fruits that either have been or should be cultivated in these Islands. Of those included in this list the great majority have already been cultivated here, although some, cultivated only in private gardens, have died out through improper cultivation or neglect, and of the remainder I can, with few exceptions, speak from personal acquaintance in other tropical regions. All these I believe can be grown here, and if they can gain admission to our gardens under the present somewhat strict system of inspection which deters most amateurs from trying the risky experiment of importation, will add to our table

attractions. Doubtless other travelers in tropical regions might add other fruits from their own discoveries, and perhaps I shall be told that others in my list have been tried and found wanting, but this Institute is founded for the helpful increase of knowledge, and such criticisms tend that way.

I am in a position to come in contact with the most intelligent of our visitors and the question is often asked "Where are your native fruits?" They repeat what we all know that our markets are filled with the fruit they have just eaten in California, and could have eaten all over the United States. They find neither in the market nor at their hotels anything else. Occasionally one can find at a Chinese fruit stall breadfruit, (which I have seen one of our military visitors trying to eat as he would an apple,) soursops, carambolas, and water lemons and ohia ai get more generally into the market at times, but where outside our own gardens can even good bananas be obtained? Go to the West Indies, Jamaica, for instance, and you may not be there in the best season, but will always find such a display of fruit as will astonish and puzzle you. You will need a guide to direct you to what is best, so great is the variety. The same might be the case here with a little exertion and my object tonight is to call attention to some neglected fruits, and perhaps suggest new uses of what we have, to in some measure remedy a state that all visitors notice and deplore. Some-years ago it was my privilege to entertain at luncheon a party of friends from Boston, and I placed before them thirteen fruits that the majority of the party had never before tasted, and many were entirely unknown by name, but all were liked, and on his return to Boston one of the party described that luncheon in an address on these islands, and I fear that I shall never hear the end of that fruit unless some of you will kindly surpass it with some of the newspaper visitors that come here.

I have arranged my list not in alphabetical order, but in the natural sequence of families as generally recognized by botanists, and I should warn you at the beginning that the specific, and sometimes even the generic names of fruit-bearing plants are not always of universal acceptance, a situation easily explained by the astonishing variation among cultivated fruits, a variation which Mr. Luther Burbank has taken advantage of to produce those results that have astonished so many visitors to Santa Rosa, besides myself. The fruits that are attractive to man he cultivates and most of them respond to cultivation until those that have long

been the object of man's care, like the banana and orange, can no longer be traced to their parent form. Few but botanists would recognize the blood-relationship between the medlar that is unfit to be eaten until rotten and the apple of our modern horticulturalists, perhaps the most universally accepted fruit.

But I am getting upon dangerous ground, for in matters of taste man (alone perhaps of animals) fortunately differs from man, and what is a good fruit to one is quite insipid to another; to some, apples are poisonous, to others oranges; and an English officer has declared the foul-smelling durian to be "*undoubtedly* the finest of fruits." So I will neither quote Humboldt's three best fruits nor give my own preferences. And this the more readily since we all know that the same fruit grown under different cultural or climatic influences produces a very attractive or only a fairly good result. The Fameuse or Snow-apple of Canada, dark red skin, white, crisp meat, and of delicious flavor in that cold climate is merely commonplace when grown in Massachusetts, and the Manila grown mango throws our best Hawaiian grown mangoes into the second class. We are in many cases unfortunate here either from improper cultivation or a wrong selection of locality, and not a few of the tropical fruits grown here are inferior to the same fruits grown in Central America or the East Indies; but this should incite us to renewed exertion, farther experiments and doubtless better results.

As my list is a long one I will take it up without longer preface.
Anona of the family Anonaceae.

A. cherimolia, the purple cherimoya of Peru. Of this there are two varieties, one smooth, the other with a tubercle on each scale. The pulp is a soft, sweet mucilage. I do not know of any trees of this species bearing on these islands.

A. squamosa, the Custard apple of Central America. This species has long been cultivated on these islands, and the first I ever tasted was in the garden of Rev. Oramel Gulick at Waiohinu, Hawaii, forty-two years ago. It has run wild over the southwest part of Hawaii. As the custard-like pulp contains no acid it seems tasteless to many, but is good food for invalids. In India it is claimed that when the tree is pruned in the hot season the fruit of the succeeding crops is of double size.

A. reticulata, called Bullock's Heart from its shape and reddish-brown color. The soft sweet pulp is not much esteemed.

A. muricata, the Sour Sop, grows well in Honolulu, and in Guatemala is a favorite fruit. The acid and strongly flavored pulp is disagreeable to many persons, but enough like it to cultivate it more than any other variety of this genus. A cluster of three fruits, from the Punahou region, weighed 15 pounds, a size exceeding any I have seen in Central America.

Garcinia mangostana, the Mangosteen of the family Guttiferae, is found on the Malay Peninsula and in the Moluccas; its northern limit is 14° at Tenasserim, and its southern at 7° S. I have tried it in my garden and so have others, but when it fruits the result is almost worthless, and I do not believe it can be grown on this group unless by grafting on the native allied genus *Calophyllum*, the native Kamani, it might be rendered hardier. Heat and moisture throughout the year seem essential to its growth. Many species of this genus are edible and produce gum gamboge, but this species is considered the most palatable of all fruits. The tree is handsome, I have seen it in perfection in Singapore, with dark green opposite leaves and the fruit is a drupe two inches in diameter with an outer fibrous covering dark red or purple on the outside but crimson within; the pulp enveloping the seeds is snow-white and of most delicate flavor. In Malacca it fruits in July and December. If a Luther Burbank could develop a variety that would grow in our hot, moist valleys, it would be a great boon to us.

Mammea americana, of the same family, the Wild Apricot of South America, is grown here and I have eaten a good fruit here from the St. Louis garden. The fruit weighed 35 ounces. Perhaps the *M. africana* might do better; its fruit is pronounced delicious by those who have tasted it.

Hibiscus sabdariffa, of the Malvaceae, the Roselle of the gardens, is peculiar in that the thickened calices form the fruit, which makes an excellent sauce, resembling that of cranberries.

Durio zibethinus, the Durian of the family Malvaceae, has been grown on both Maui and Kauai. It is found in the Moluccas and extends as far as Mindanao in the Philippines, but its native place is the Malay Peninsula, the home of the finest of the tropical fruits, where it is a lofty tree, the flowers being arranged in clusters on the trunk and older branches, and the fruit is as large as a small melon, covered with rough points. This falls, when

ripe, disclosing five lobes of a creamy consistency and whitish color in which the seeds are embedded. It is in season in May and June, but there is often a secondary crop in November. It must be eaten fresh as it soon decomposes. The smell is nauseous to most Europeans. The trees grow in clumps and a single clump will scent a whole village. In taking it to market, the fruit is hung in baskets on the top-masts of the boats. The extent of its range and its climate is about the same as that of the mangosteen, but it will endure almost any soil. All attempts to cultivate it in Hindustan have failed.

Averrhoa carambola, of the Oxalidaceae or Sorrel family, a native of the Moluccas, grows well in Honolulu, but is not duly appreciated by the whites. The tree is handsome with its feathery foliage, and the five-angled fruit, yellow when ripe, has a pleasant odor and a most refreshing acid taste,—too acid indeed without sugar. The juice contains hyperoxalate of potash. Sliced and stewed it makes an agreeable sauce of peculiar flavor, and in this climate we have too few small fruits like currants, gooseberries, etc. There are two varieties, the acid and the sweet, but the latter is inferior. Propagated readily by seed.

Averrhoa bilimbi, the Blimbling, is a larger species, quite acid, used in India for sauce, curries, pickles and preserves. I have eaten it preserved in India, but have not seen it here.

Skimmia japonica, family Rutaceae, might grow here and would be a desirable small fruit.

Citrus, another genus of Rutaceae, is a most difficult genus for botanists, at any rate they do not agree on the nomenclature of the different species, and find difficulty in referring the innumerable varieties to definite species. I need here give little more than an enumeration of the principal divisions of a subject on which Risso and other horticultural botanists have published folio volumes.

Citrus olivaeformis, the Kumquat so well known as a Chinese preserve, but not enough appreciated for its adaptability as a dwarf ornamental tree, so often seen in China and Japan. The round variety is common in our gardens and is both ornamental with its golden balls which persist so long, and is admirable for orangeade and preserves.

Citrus medica, the Citron. I do not know how much of the preserved rind of this orange we import, but if profitable the tree would no doubt grow here.

Citrus limonum, the lemon, certainly grows well here, but is attacked by the purple scale which is often fatal. I have a tree in my garden which bears abundantly fruit of the finest quality; large branches of it have been layered and removed farther up Nuuanu valley, where they also are doing well. Why should we import lemons?

Citrus acida, the lime, as we all know, grows well all over the group, especially well in Puna on rather poor soil, but in spite of that limes cost more in Honolulu than in Boston, and those we get from Mexico do not compare in size and quality with those from Honduras. I have purchased delicious and juicy limes as large as the average lemon at Trujillo for one dollar (Mexican) per barrel. The people plant the tree in hedges, keep it closely trimmed and it bears constantly. Could not our Board of Agriculture get us some of these plants?

Citrus limetta, the Sweet Lime, is a common fruit in Central America, but not attractive to those who like limes or lemons. Without the acid its flavor is flat.

Citrus bigaradia, the Seville or bitter Orange, is used for flavoring rather than as a fruit. The skin is used for the Curaçoa liqueur and the flowers to perfume oil of Neroli; the peel is also candied. One acre has produced £50 worth of flowers.

Citrus aurantium. I do not know that the Syrian orange sold in the streets of Jerusalem and Cairo has ever been tried here, but it is generally considered by good judges of fruit the king of oranges. It is large, juicy and without much pulp, while the flavor is delicious. The so-called Coolie orange of India and China is close-skinned, like our Kona orange, and perhaps better in flavor. The St. Michaels orange, a flat yellow variety from the Azores was in my boyhood the favorite orange sold in Boston, as most of the Fayal trade was with Boston. I believe it a fact that one tree has produced 40,000 fruits in a season.

Citrus decumana, the Pumelo from which come the Shaddock, Forbidden Fruit, Grape Fruit, etc. To me this is the chief of the citrus family, but we never see here the famous Amoy pumelo. In China this fruit has been cultivated from time immemorial, and

it is mentioned in the time of Yu, who may have been a cotemporary of Noah. The Amoy grown fruit is most highly valued and has pulp red as a ripe watermelon, and as attractive in taste as in looks. The name Grape Fruit was given to a smaller variety from the West Indies by Boston marketmen from its resemblance and taste to the Malaga grape, which was formerly imported in great quantities into Boston. Excellent Grape Fruit has been raised here, almost as fine as some from southern California. Pumeloes also do well here, but in some cases the tree dies young after a few crops. Those at the Lunalilo Home, planted by Judge Dole, are of good age and show no signs of failure; the fruit is of good quality.

Three fruits belonging to this same orange family should be tried here if this has not already been done; they are the three following:

Ægle marmelos, the Beal or Beel. The fruit is green outside, yellow inside and very delicious when ripe. Mr. Jared Smith assures me that he has seen this fruit here.

Cookia or *Clausena punctata*, the Wampu of China, where it is a popular fruit, although small.

Glycosmis citrifolia, also a small but well flavored fruit.

Of the family of Rhamnaceae, not noted for its edible fruits, we have one species grown here, but which is made little use of as a fruit. I refer to the Jujube or *Zizyphus jujuba*, a handsome tree, not uncommon in gardens, with a small green fruit like a crab apple. This is seldom eaten raw, but yields the paste of the confectioners. Worth cultivating for ornament or for the wood which is hard and valuable.

Vitis vinifera. I do not know what variety of the grape Manini the Spaniard cultivated for the wine he made in early days, but I suppose it to have been the Mission grape as that flourished here in the early sixties and I have had fine bunches from the Princess Victoria's place on the Queen street shore, as it was then. They were also growing on the Knudsen place on Kauai. At present the Isabella seems to have driven out all others, although a few years ago my old friend Gonsalves, the Portuguese gardener, brought me a splendid bunch of Tokay, sweet and well colored.

Cupania sapida, of the family Sapindaceae, usually called Akee

has an edible aril and is an attractive tree much cultivated in Central America.

Nephelium litchi, the well-known Chinese dried fruit, grows well in Honolulu, but is a slow grower and does not bear until ten or fifteen years old. The tree in the Afong garden is still the largest and probably the oldest and has been bearing many years. The fresh fruit is excellent, and brings a very high price in the local market. A variety differing from this fruited last year at Punahou (Fig. 1), and another is said to have been introduced that bears in less than ten years from planting out. Smaller in size, but more delicate in flavor is the other (of the many known species) that is grown here, the Dragon's Eye (Fig. 2) of the Chinese, a fruit that plays an important part in Chinese worship and is greatly prized.

Nephelium longana is a handsomer and larger tree than the Litchi, and the russet colored fruit hangs in large clusters like grapes. It grows readily from seed and should be cultivated more than at present. Unfortunately it bears on alternate years, and as all the trees at present in bearing were of the same age, some one must pick the blossoms and so throw the tree into the odd years.

Pistacia vera, of the family Anacardiaceae, yields the Pistachio nut with a bland, oily kernel, much used in confectionary. The tree is fifteen to twenty feet high and a native of Afganistan. One hundred and forty tons of this nut are annually imported into India from Kabul by the Bolan Pass. It should grow on the higher lands of this group.

Mangifera indica, the Mango of the same family, need not be enlarged upon in this list as a very comprehensive paper on this fruit has been published here. I need only say that having tried good fruit in both the East and West Indies I think the former superior. It may, however, be noted that there are many wild varieties in India eaten with relish by the natives that would not be liked by any European taste.

Anacardium occidentale, the Cashew Nut, is cultivated here to some extent and is readily grown from seed. It is a native of South America and as a fruit is curious rather than delicate. The nut, which yields an oil finer than olive oil, is outside of the swollen stem which is the fruit. The nuts are roasted and are then considered a good but rich food.



FIG. 1.--LONGAN FRUIT. *Nephelium longana*. Grown by Dr. Brigham.



FIG. 2.—LITCHI FRUIT. *Nephelium litchi*. Variety grown at Punahou.

Spondias dulcis, the Vi or Wi, the Tahitian quince, is well-known here and grows well from Hawaii to Kauai. While some are very fond of this fruit others consider it a very inferior one. The fructification varies considerably; some seasons the fruit is numerous in clusters, but small in size, at others there will be but a few fruits in a cluster, but they will be large. Another species is common in Guatemala and might well be introduced here.

Spondias lutea, a plum-like species. The tree in Guatemala grows to considerable size, and as even large branches when stuck into the ground readily take root the tree is much used for fencing. The fruit is either yellow or orange and very juicy. From the juice a good cider is fermented, that has considerable intoxicating power although the dose must be considerable to produce the hilarious effects I have seen among the Guatemaltecan peasants. The seed bears a remarkable resemblance to the peanut pod when dry. I have tried several times to procure this valuable tree for these islands but without success.

Tamarindus indica is well grown here, both for its fruit and wood. It belongs to Leguminosae.

Arachis hypogaea, the ground nut, is of the same family, and was formerly cultivated on the other side of this island with some success.

We come now to a number of genera of the Rose family, Rosaceae, one only native, but most of the others tried with more or less success on these islands.

Prunus amygdalus, the almond. My first sight of this fruit was in the garden of a Frenchman in Kalihi, more than forty years ago. I have forgotten the name of this hospitable man, whose garden I stopped to inspect, and who compelled me to stay to luncheon; but the almond was more strongly impressed on my memory. The trees were growing well.

Prunus persica, the peach. The stock that does best on these islands is said to be of Chinese origin. It does well as far up the slopes of Mauna Loa as Ainapo, and if properly trimmed is very satisfactory in Nuuanu valley. I have for years cultivated several varieties, but of late years have cut down my trees as the police were powerless to protect me from fruit thieves, the curse of this

place for fruit growers. Peaches were stolen before they were ripe, when other fruit was untouched.

Prunus armenaica, the apricot, I have seen growing both in Dr. Hillebrand's garden and farther up Nuuanu valley, but I do not know that they have fruited.

Chrysobalanus icaco, the Hog Plum of the West Indies, should grow on our shores, and it makes a very agreeable preserve, although I have not tasted the fresh fruit.

Parinarium campestre or an allied species is found in the islands of the western Pacific and is noted not only for its gum which is used to calk the native canoes, but for the edible and 'nutricious kernel of the fruit. It was described by Mendaña when he discovered the Solomon Islands.

Rubus hawaiiensis, the Akala, is a well known but not a very fine fruit common in the forests of the uplands of Hawaii. The fruit is yellow or red and very acid; stewed it is more palatable. Another raspberry has been introduced from Japan. I do not know its specific name, but it has been thoroughly naturalized near the volcano and on the road above Olaa. This is not much better as a fruit than the native berry, but its fecundity is so great that it might be worth while to try to improve it.

Fragaria chiliensis, the wild strawberry, was introduced at some unknown period, and was formerly very abundant around the Volcano House and indeed all over the uplands of Hawaii, but the wild hogs have nearly extirpated this desirable berry.

Fragaria vesca, the common strawberry, is cultivated mainly by the Chinese here and the quality does not improve. Some raised at Wahiawa last season were, however, very fine, the best I have seen on the Islands.

Cydonia vulgaris, the Quince, might grow on the uplands, near the volcano.

Photinia japonica, the Loquat, grows well enough, but the quality of the fruit is very variable according to locality. When well-grown it is a good fruit, perhaps as good as any from Japan.

Pyrus malus, the Apple, fruits here but the strange growth of the tree shows it is not at home. I have eaten apples grown in Honolulu, when fruit was not imported from the Coast, that were

not bad, but the cultivation is hardly to be thought of in face of present importations.

Terminalia catappa of the family Combretaceae, the Umbrella tree, often miss-called kamani, is common in gardens, but the nut, which is highly prized in the islands of the western Pacific, is seldom eaten here. The kernel is quite palatable.

The Myrtle family yields us almost as many fruits as any other. To this family belong our *Metrosideros*, *Eucalyptus*, *Barringtonia* and other trees as well as the following fruits:

Psidium guyava, the common guava, which has become thoroughly naturalized on all the islands.

Psidium cattleianum, the Strawberry Guava, both red and yellow. The manufacture of charcoal from guava wood by the Japanese is becoming more important than are the fruits. It is perhaps impossible to state the amount of charcoal made from this source, but I seldom meet less than two large wagon loads daily in driving from town to the Museum.

Eugenia malaccensis, the ohia ai of the natives, the mountain apple of the whites, is one of the few native fruits. It looks better than it tastes, but I cannot find that it is any better in the East Indies where it also grows or is native. Several allied species are cultivated here, Rose Apple, etc.

Eugenia jambolana, the Java plum. This myrtle grows rapidly and bears several crops in the year, but is not regarded as a very good fruit. In the East Indies it is much more highly esteemed, both as a fruit and as medicinal. Properly boiled the fruit yields a good syrup.

Eugenia piperita, Barbados cherry, a shrub easily propagated and growing rapidly. It is very ornamental even when not covered with its white inflorescence, and the lobed fruit which varies from scarlet to deep crimson when ripe, is juicy and wholesome. Its quality varies greatly in cultivation; if neglected it becomes small and insipid.

Eugenia uniflora (?), the Spanish Cherry, is a favorite fruit with those who know it. My first introduction to it was on a tree in Pauoa Valley planted by Manini (hence the name Spanish). It does look like a cherry with its long stem, and the blossom still more strongly resembles the inflorescence of

that fruit. Unfortunately it does not keep long and must be eaten from the tree.

Bertholletia excelsa, the Brazil Nut. There are two Brazilian trees that certainly deserve notice if not cultivation, the *Bertholletia* and the *Lecythis*, and strangely there is no record that I can find of the cultivation of either in foreign lands. The nuts are exported to the Eastern States and to Great Britain. Those of the former are known as Brazil nuts, those of the latter as Paradise or Sabucaia nuts. They are somewhat similar as both are packed in a wooden case, six inches in diameter and half an inch thick. The rather large nuts are packed within this strong box so closely that it is impossible to replace them when once removed. The tree of the present species is one of the tallest in the Brazilian forests; whether we have a sufficiently rich vegetable soil I should doubt.

Lecythis sabucaja, *Lecythis oiiaria*, these two species produce similar nuts and are desirable trees if they can find a rich valley bottom, well watered and sheltered, and the fruit would not only enrich our dessert, but be easily exported to supply the Pacific Coast, as it comes already packed.

Punica granatum is raised in many gardens, but as an ornament, for there is less use of the pomegranate than there should be. In southern Europe it is largely consumed, and it is growing in public esteem in the Eastern cities.

Passiflora edulis, the purple fruited Passion flower has become naturalized on Hawaii and Kauai, known by its native name lili-koï. In the Colonies it is seen in all the markets, and as it keeps well even when wrinkled as a raisin, has a long season. The fruit is not only refreshing, but is a very popular flavoring for ices. The vine is hardy and prolific.

Passiflora quadrangularis, the granadilla here is a large fruit, (I have raised them seven pounds in weight) and very delicious. There is a variety much smaller and round, but of the same flavor. This vine is very prolific, bearing several crops each year. The blossom is handsomer than that of *P. quadrangularis*.

Passiflora laurifolia is the Water Lemon of the West Indies. Not common here.

Passiflora maliformis, the Sweet Calabash, is often called Water Lemon here and Granadilla in Central America. It is common in our markets in the early summer, the lilikoi being an autumnal fruit.

Carica papaya is like the Passion flowers, a native of tropical America, and was probably introduced here in early days. Wild ones abound in the Guatemaltecan forests on the Pacific coast. The Hawaiian fruit as we all know varies greatly in quality, but the better sorts are not surpassed anywhere. Either fresh, as a breakfast fruit, or baked in slices with plenty of lime juice, it is a palatable fruit.

Curcubita moschata, the Musk Melon, has almost disappeared as a native product. Cantaloups were in former years brought in abundance to our doors, but they soon became inferior, as the Chinese gardeners sold all the finest ones and kept only the smallest unmarketable ones for seed. I tried importing good seed and distributing it to the Chinese, and for a season the results were good, but they soon fell back into their old ways, and now the trouble seems to rest in a worm that all our entomologists do not seem able to cope with.

Citrullus curcubita, the Watermelon, also needs selection; the average quality does not seem as good at present as it was forty years ago. In India it is claimed that seed of the melon is improved by keeping four years. I do not know that any one here has tried the experiment. As the seeds are eaten they are certainly better a little dried.

Opuntia tuna of the Cactus family, the Pa bipi of the Hawaiians, we have both in the red and the greenish-white varieties of the fruit: both become larger and more pulpy under cultivation. Eaten and liked by the Indians of tropical America, here they are generally left for the birds.

Coffea arabica. . . Coffee of the family Rubiaceae may be classed with fruits as the berry at a certain stage of ripeness is juicy and sweet with a little coffee flavor. The berry of *Coffea liberica*, although larger is not so juicy. Time and again, when riding through the coffee plantations of Guatemala, I have found refreshment in the red berry of the former.

Morinda citrifolia, the Noni of the Hawaiians, would hardly be

classed as a fruit by Europeans, but is used as a medicine and was once eaten by the natives.

Vaccinium reticulatum, the Ohelo, is a Hawaiian fruit of a very different character. It flourishes high up the mountains in poor soil, often growing in mere cracks in the rocks like its relative, the blueberry of Canada, and loses most of its good qualities when it ventures towards the coast on some lava stream as is occasionally seen in Puna. The allied *Gaylussacia resinosa*, or huckleberry of New England, I once tried to introduce here, and Judge Dole, then a law student with me in Boston, undertook to plant on the mountains of Hawaii a quantity of seeds I had prepared, but I have never seen any signs of these and fear they did not take kindly to the soil.

Chrysophyllum cainito, the Star Apple of the Sapotaceae, grows well here and there are a number of trees about Honolulu. The fruit certainly looks well, but is not of a decided flavor, although some like it very well.

Achras sapota, the Sapodilla, is by many considered a good fruit, and is popular in the West Indies. There are trees of this fruit in Honolulu.

Lucuma mammosa, what is called sapote in Guatemala and Mammee-apple in the West Indies, does not belong to the genus sapota. It is a fruit with a rough leathery outside, the meat reddish surrounding a smooth nut, and the whole flavored with cinnamon. I have seen some sapotes as large as a coconut but usually they are not half that size.

Diospyros kaki, the Japanese Persimmon of the Ebenaceae, is, I think better preserved than fresh. I have seen it fruiting admirably in the rich bottom lands north of Sydney, N. S. W., and as it is also cultivated in Burma, this handsome fruit might do well here. It is often in our markets from southern California.

Diospyros mabola, a native of the Philippines, is often improperly called mangosteen. The fruit is brown, about the size of a quince, and is pink colored within. Those who have tasted both consider this species better than the Japanese one. All the trees of this ebony family that will grow here would be desirable for the timber, which always commands a high price.

Olea europæa, the Olive, has 21 Spanish and 13 French varieties. One tree at Villefranche produced in good seasons from 200 to 230 pounds of oil. On the Australian coast the tree does well: I have seen there mere bushes planted in the public grounds at Adelaide, bearing profusely, and on the other hand I have a tree of the most esteemed variety from Sta. Barbara planted in my garden in 1896 forty-two inches round a foot from the ground, and thirty-five feet high, that has never even blossomed. The general opinion has been that the olive will not fruit on these islands, but I am glad to hear that Wahiawa, which brings us so many good things, has fruited olives of good quality. Another species, *Olea paniculata*, is frequently cultivated here for ornament, and fruits readily, but these are not edible. Neither is the fruit of the Chinese favorite, *Olea fragrans*, which should be better known here for its fragrance which pervades whole villages in the flowering season and gives flavor to many a chest of tea.

Solanum nodiflorum, the Popolo, is eaten by Hawaiians and cultivation might render it more agreeable to European taste.

Lycopersicum esculentum, the Tomato, or as it was called when first brought from tropical America, little more than two generations ago, Love Apple, was cultivated as an ornamental plant, later as a vegetable, until it has won its way to the position of a dessert or salad fruit. The small globular variety has run wild in these islands and is a pleasant subacid fruit.

Physalis peruviana, the Poha, still another of the *Solanum* family, attains its greatest perfection on the high plateau of Hawaii around the ruins of the Ahua Umi.

Piper Betle of the Pepper family is allied to the Awa and certainly is not a fruit, but a leaf, still in combination with the fruit of the Areca palm it forms a delectable mixture used by almost the entire Malay race.

Myristica fragrans, the Nutmeg, grows well in Honolulu and a fine tree stood in the garden of Judge John Montgomery—now the St. Louis School. Unfortunately the people of the school, not knowing what it was, cut it down to make room for some school building.

Persea gratissima, the Palta or Avocado Pear, of the Laurel family, is now commonly cultivated all over the group. The fruit

varies greatly in quality and in some places the trees, while not old, seem to be dying out.

Aleurites moluccana, the Kukui, produces a nut too rich to be eaten as a walnut, but exceedingly palatable when roasted as in the *inamona* of the natives.

Phyllanthus distichus, the Tahitian Gooseberry, is a shrub with small reddish flowers followed by a roundish, subacid fruit the size of a marble. A desirable small fruit which I do not think has yet been cultivated here.

Morus alba, the white Mulberry; the fruit is small and sweet; originally introduced for food for silkworms.

Morus nigra, the Black Mulberry; the fruit is readily forced by trimming and is not unlike the Black Cap Raspberry of the Eastern States.

Morus atropurpurea of China produces a very agreeable berry two inches long, and in great quantities. Why not cultivate this in preference to the *alba* and *nigra*, which were planted here for silkworm food?

Ficus indica, the Fig. It seems unnecessary to enlarge on the cultivation of this useful fruit, which here is mostly in the hands of the Portuguese, but I may call attention to the profit that might be in curing the white or Naples fig, which grows freely, bears heavily and the fruit dries without decay on the tree. Dried, these figs bring (or did some years ago) double the price of Smyrna figs; they also are not tough skinned and insipid like the Californian dried figs.

Artocarpus incisa, the Bread-fruit, is rather a vegetable than a fruit, and is planted for ornament rather than produce. As the old gardens fall into the hands of the Orientals the breadfruits come more and more into the market.

Artocarpus integrifolia, the Jack, is also an ornamental tree, and although the fruit grows to a considerable size on the north coast of Hawaii, the fruit value is very inferior. In Singapore the immense fruit is filled with white seeds surrounded by a yellowish transparent jelly of foul smell, but agreeable taste, so that those who have no sense of smell (a larger proportion of civilized mankind than is generally supposed) can happily enjoy the Jack-fruit.

Ananas sativa, the Pineapple of the family of Bromeliaceae, is largely cultivated here and ranks well as a fruit. Some that I sent to Boston were pronounced by judges familiar with West Indian pines, superior. The pine growing wild in Kona, Hawaii, is small but of excellent flavor.

Bromelia pinguin, the wild pine of the uplands of Central America, is juicy and attractive as it forms hedges by the wayside.

Zinziber scrubet, the Ginger, cannot be called a fruit, as the rootstock is the important part, but it is when preserved decidedly a sweetmeat, and seems to be always on the sideboard of a Chinese gentleman. Many species of the ginger family flourish in these islands, some have become naturalized, and I am surprised that our Chinese with the lessening profit from their rice fields do not cultivate ginger for preserving.

Musa sapientum, the Banana. There is need of importing better stock than the Chinese if we are to compete with the West Indian bananas in the San Francisco market. The people there will not be always satisfied with the poor fruit we are now sending them. There was a time when the red banana was the principal kind in the Boston market; it is now rarely seen there, and in Guatemala it is fed only to the hogs.

Musa paradisiaca, the Plantain. The difference between banana and plantain is often not understood, and some suppose that all plantains are cooking bananas. Persons who have raised both species can tell at a glance from the habit of the tree, but the simplest distinction is that while the banana ripens its fruit from the top of the bunch, the plantain ripens from the bottom. Also plantain bunches are much smaller than those of the banana, that is have fewer hands, and for that reason plantains are sold not by the bunch, but by the hundred. At the port of Livingston, Guatemala, while a bunch of fine bananas of twelve hands sells for fifty cents, plantains are quoted at \$1.25 per hundred. The latter is supposed to have a greater food value. On the Pacific Coast as at San Jose de Guatemala, magnificent plantains grow a foot long and of proportional diameter. These are not unlike in taste to our *maia maoli* of the Kona coast of Hawaii.

Cocos nucifera, the Coconut, certainly does not flourish on these islands, and as a fruit is very inferior. Still, as it is, we do

not avail ourselves of all it offers. In India no curry is complete without it: in Honduras fish is boiled in the "milk" to its great improvement, but these are only suggestions of some of the 500 uses of this most useful of nuts. It is true that some of the nuts from the southern islands have been planted but these are not yet visible in the market.

Cocos Weddelliana or *Wedellii*. A palm cultivated in some gardens that bears an edible fruit of good flavor. I cannot identify it having seen only the fruits.

Phoenix dactylifera, the Date. Although this palm grows well and fruits abundantly (a young date palm in the Kamehameha School grounds this year bore twenty bunches weighing from twenty to twenty-five pounds each, when not yet fully grown, or more than 450 pounds to the tree,) the fruit is generally worthless, at least compared with the excellent dried dates I have eaten in Egypt, and which with parched corn made a good day's ration for a traveler.

Areca catechu, the Betel Palm, grows well here and bears abundantly; not being a chewer of betel, I cannot speak of the quality of the fruit for mastication.

Pandanus odoratissimus, the native Lauhala. This and other species afford important food to many Pacific islanders, but can hardly be called good fruit.

Monstera deliciosa, the last in my list, is by no means the least. To my own taste it far surpasses the pineapple, but is an awkward fruit to eat as it ripens by degrees taking several days. Belonging to the Kalo family, it is a curious exception to the usually hot or acrid fruits of the arums, but cultivation is doubtless the explanation of its large highly flavored fruit. In Central America it grows luxuriantly, but the scarce fruit is not attractive. With me the more luxuriantly the vine grows the more abundant and better the fruit, which takes more than a year to ripen.

Upon the conclusion of the paper an open discussion took place upon the cultivation of tropical fruits in Hawaii generally. Mr. W. W. Hall, after complimenting Dr. Brigham upon the interest and utility of the data which he had compiled, referred to the excellency and quantity of the Hawaiian grown oranges which were obtainable in Honolulu forty years ago. These he described as being exceedingly juicy and of a flavor which imported oranges

never possess. This fact he attributed very largely to the fact that oranges from other countries were necessarily plucked before their full flavor was developed, but it was a characteristic which gave to the Hawaiian orange a superiority in the home market over all others. In his youth, the speaker reported, the oranges from Waialua and Kona were particularly in evidence, and both were of excellent quality. The Waialua oranges were generally of golden yellow color, while those from Kona were of a characteristic russet color. In Mr. Hall's opinion the Hawaiian orange of years gone by was far more acceptable than the modern mainland product.

Dr. Brigham spoke in support of Mr. Hall's appreciation of the oranges to be obtained in former years. He well remembered one tree in particular, remarkable alike for the excellent flavor of its fruit and the facility with which it could be separated from the rind. In one season this tree, which belonged to Father Bond at Kohala, had produced as many as ten thousand oranges.

Mr. Jared Smith said that the original oranges from which the present California oranges were evolved were in many ways similar to the old Hawaiian ones. As a rule although exceedingly juicy and of good flavor, such oranges possessed a very large number of seeds which had been bred out by systematic selection. If he remembered correctly the original fruit from which the Florida oranges have sprung contained as many as 85 seeds.

Mr. Emmeluth reported that there were still a great many excellent oranges grown in the islands, but for some reason they seldom found their way into the market. While on Kauai last season he had been struck with the quality of some fruit he had seen and had arranged for a box of assorted varieties to be sent to him in Honolulu. Upon arrival he found they had evidently not been properly packed, as they were loose in the box and many were in bad condition. He had endeavored to obtain another consignment of the variety he had liked most, to reach Honolulu in time for the present meeting, but unfortunately it had not yet arrived.

Mrs. Nakuina said that many of the Molokai gulches produced quantities of excellent oranges. She had often remarked that after a dry season the fruit was not only small and poor, but full of pips, while after plentiful rain it was juicy and comparatively free from seeds. The reason the fruit was not shipped to Hono-

lulu was that difficulty had been experienced in packing it in such a way as to allow it to arrive in the market in good condition. Much of the fruit was allowed to rot on the ground in consequence of this.

Judge Dole informed the last speaker that in order to insure the arrival of citrus fruit at the market in good condition a process called "sweating" was necessary. This was more or less elaborate according to the fruit, but with oranges it merely consisted in placing them in ordinary orange boxes which are so constructed as to allow free evaporation on each side. The fruit was usually picked from the trees and placed in the boxes where it remained for about two days. During this time the fruit exuded considerable moisture, chiefly from the rind which became drier. After two days the fruit was removed, allowed to dry and repacked. The process required for lemons was more difficult to operate successfully. The speaker suggested that in view of the very general interest in the subject it would be well if the Hawaii Experiment Station should make known the method of sweating citrus fruit for market.

Mr. Webster related that while in Florida he had visited the orange packing establishments. The fruit was placed upon large tables down which it rolled. At the bottom were holes of different sizes. The small ones were encountered by the fruit first, and through these the smaller fruit passed. In this way the fruit was graded into various sizes. Before packing each separate fruit was wrapped in paper. The boxes were filled until about one layer projected above the sides, when the lid was nailed down. In this way the oranges remained firmly held together and after undergoing certain shrinking did not shake in the box. In northern States, apples were subjected to much the same process, being packed in barrels until well above the sides when slow pressure was imposed until the top could be fastened down.

Mr. Weinrich informed the meeting that he had frequently seen citrus fruit in large quantities going to waste in orchards little removed from the market. He regarded it as a reproach that such a state of affairs should exist and instanced the case of a large sugar plantation which, after going to considerable expense in planting fruit trees, lost interest and allowed them to perish from neglect.

Mr. Austin, whose work as inspector of fruit importation allows him to speak authoritatively, said that he had kept a careful account of the citrus fruit which entered this port from California and found that its gross value amounted to about one hundred thousand dollars per annum. If the Territory could only be made to appreciate the money it was expending on the Coast in preference to keeping it at home, this condition of affairs would not continue.

Mr. Hall said that he would like to make known the result of an experiment he had made upon a fig tree which grow on his land at Pearl City. The tree in question had been unproductive for some years, but he had lately well pruned and fertilized it with the result that its last crop had numbered at least twelve hundred fruits. In one day he had picked two hundred figs and there had been sufficient fruit from this one tree to supply two or three families besides his own. Even the mynah birds had partaken without appreciable effect on the supply.

Mr. Austin informed the meeting that fig trees produced their fruit on the new wood and that judicious pruning not only stimulated the tree, but increased the available fruit producing twigs. Peach trees might be treated in the same manner with success.

Mr. Roberts recommended that those people whose trees did not bear so well as Mr. Hall's, should try a device for frightening away the mynah birds from fruit trees, which he had tried with success. After removing the bottom from a number of beer or similar bottles he corked them and passed a string through the cork to which were attached inside the bottle a few nails. When these were suspended from the trees the action of the wind caused them to emit a continuous tinkle which aroused the suspicions of the birds and kept them at a distance from the trees.

The following paper was then read:

THE FOOD VALUE OF TROPICAL FRUIT.

BY DR. EDMUND C. SHOREY.

When I was assigned the task of preparing a paper on this subject several questions were asked me which showed that on several points there was a possibility of difference of opinion. These questions may be summed up in two; what is fruit and what is food?

Taking the latter question first—what is food. Food in the general sense may be taken to mean anything that is taken into the digestive system of man or animals, either to satisfy hunger, or to excite pleasurable sensations through the taste. In this sense the term food is used in laws regarding adulteration; food in this case including drinks and condiments. The more scientific or exact definition of food is that it is that which supplies material for growth, replaces the waste of the body or furnishes the energy by which the body performs its functions, or the work necessary for its existence or mode of living.

With regard to the functions of food probably the first thought is that it is that which furnishes material for growth, increasing the size or weight of the body. This, however, is not its chief or most important function. In all living animals there is through the mere act of living a waste of tissue. The involuntary action of the muscles of the heart, whereby the blood is circulated; the almost involuntary action of the muscles which produce respiration, can only take place through destruction breaking down or change of composition of the tissues. No man, however lazy, can live without work is true in the most extreme sense, and to supply material to replace tissue destroyed in this work food is necessary. Even "father" of the popular song who "lies around all day" probably found it necessary to take some nourishment. In addition to these unconscious or automatic exertions which accompany the mere act of living most of us find it necessary to do various and sundry acts known as work or labor. This work whether it be the mental effort necessary in the preparation of a paper for the Farmers' Institute; the vibration of the vocal cords of a candidate for election addressing an audience; the tension of the muscles of a road laborer as he rests on his pick or hoe handle; in short any motion or use of any part of the body is the result of decomposition or breaking down of tissue. This tissue must be renewed or the capacity for work ceases. This renewal is effected by food. What then is food? How does material which is food differ from that which is not?

We have in nature what we call forces or sources of energy such as heat, light, electricity. These forces can be transformed one into the other, for example the heat of burning coal becomes transformed through the steam of the boiler into the motion of the engine, then into the motion of the dynamo and finally into the light

of the arc lamp. Among other sources of energy is that of chemical combination. A chemical compound in the production of which energy has been used is simply a storehouse of that energy and can under proper conditions be made to give it up again; the giving up resulting in decomposition whether it be a simple compound or a complex group as in the tissues of living animals. In attempting to make this clear allow me to draw a parallel. The heat of the sun is one source of energy. This heat causes the surface water of the ocean surrounding us to be continually vaporized. This water vapor, when the upper strata of the atmosphere can hold no more, is precipitated as rain. Some of this rain falls in Nuuanu Valley and finds its way into the reservoirs. The water in these reservoirs is in virtue of its position, several hundred feet above sea level, capable of doing work; in fact does work or is made to generate electricity and light our streets. The stored water represents simply some of the sun's energy and today we need no Joshua to command the sun to stand still for we can bottle up the sun's energy by day and have it on tap by night when and where we please.

Sunlight is another source of energy. Growing plants by a complex and little understood process make use of this energy and build up by it out of the carbonic acid of the air and simple nitrogenous compounds obtained from the soil the complex organic compounds characteristic of plants. Practically all the essential parts of plants represent stored up sunlight just as reservoir water represents stored up sun heat; and just as stored up water can be made to do work by letting it flow to a lower level so the complex compounds of plants can be made to do work by letting them down so to speak to a lower level, decomposing them into simpler forms. Foods then are such higher level compounds, and every act or motion of living animals is simply the setting free of energy, which at some time has been stored up by plant from that given out by the sun. Of course all plant products are not food. Some are not digestible, such as woody fibre, the energy of which can be set free by burning. Others are simple compounds which have been already reduced to a lower level during the growth of the plant.

Chemically food material has been divided into three general groups: I. Protein, the nitrogenous compounds. II. Carbohydrates comprising sugars and starches, and III. Fats. For

the economical production of work whether in man or animal these three must be furnished in proper proportions. Protein is the most important as neither of the others can replace it.

Turning now to the question, What is fruit? we have, of course, the botanical significance of the term as that part of the plant which bears the seed whether a head of wheat, a pumpkin or an orange. The term fruit, however, is never used in this sense popularly and while there are a large number of plant products which every one speaks of as fruit, there are also quite a number about which there might be a difference of opinion. For the purpose of the present paper I will adopt an empirical definition and include as fruit those fleshy seed bearing plant products which are eaten simply for their agreeable taste as an accompaniment to or to give relish to other food.

As tropical fruits of this character I offer the following short list leaving out a large number peculiar to the tropics, but which are seen or eaten by but few persons. This list would include oranges, lemons, limes, pomelos, bananas, pineapples, grapes, figs, guava's, mangos, avocado pears and olives. It might at first sight, in view of the definition of fruit I have adopted that fruits have no food value, that they are simply agreeable accompaniments to other food. Analyses, however, of these fruits show that they have some food value and as man's digestive system is ordinarily constituted the mere intention of the eater makes no difference in the destiny of the material eaten. If the material eaten has food value it will be utilized.

In considering very briefly the composition of these fruits we find that water is a large constituent. Of those mentioned all except olives contain more than 75%. Oranges and pineapples contain nearly 90%. This large water content necessarily makes the possible food value low, but in this respect they are about on the same footing with fresh vegetables. Of the important constituent protein the amount present is small. Olives contain 2%, figs 1.5%, grapes and bananas 1.3%, avocados 1.0%, oranges 0.8% and pineapples 0.4%. Fats, of course, are absent except in the case of olives and avocados. It is in the carbohydrate group, the sugars, that we find the chief food value of the fruits mentioned. We find that bananas have 21%, grapes and mangos 15%, oranges 11% and pineapples 8%. In short there is throughout a general similarity in the composition of fresh fruits and fresh suc-

culent vegetables which may be stated generally as consisting in a large amount of water with the food value depending chiefly on the carbohydrates.

Many fruits owe their agreeable character to the acids present, and no doubt these acids have a hygienic value in maintaining healthy conditions. How far this is true with an ordinary mixed diet it is impossible to say.

We often hear of fruitarians and the dietaries of a number of these have been studied especially in California, but it must be remembered that these so-called fruitarian diets are really a combination of fruit and nuts; the nuts furnishing the protein and fats lacking in the fruit. Combinations of this kind can be made which are well balanced and which furnish all the energy necessary, but I am among those who believe that man was built for a mixed diet and that the world's work is being done and will continue to be done by individuals and nations subsisting on such a diet.

A great deal of nonsense has been written about the food value of certain fruits, especially bananas. Taking the protein content of bananas as 1.3%; to furnish 100 grams of protein per day the amount necessary for an adult man it would be necessary to consume about thirteen and a half pounds; an amount which I imagine it would be difficult to consume many days in succession and which would furnish a large excess of carbohydrates. In short it is simply an impossibility to maintain a healthy existence on fruits alone; either because the amount necessary to furnish the requisite energy is too large for consumption or because a ration so constituted is not balanced.

Viewed as class, fruits of the tropics or sub-tropics do not differ essentially from those of the temperate zone, and speaking generally their food value is somewhat the same as that of fresh vegetables. With regard to Hawaiian fruits in particular not many analyses have been made. Such analyses as are available do not indicate any material difference in composition from those grown elsewhere. The few figures I have given have been taken from published average analyses.

In summing up this short consideration of the food value of fruits I would say that there is no reason why they should not be considered more as actual foods than as pleasure-giving accessories, and where the cost will allow should have a more prom-

inent position in the diet of many, combining from a dietary standpoint pleasure with profit.

After the reading of Dr. Shorey's paper the secretary handed to each member present, a sample of sun-dried mango, which had been prepared by Mr. Harry Roberts. The fruit was well received, nearly all who tasted it pronounced it excellent. Upon being requested by Mr. Smith as to the process of drying, Mr. Roberts reported that the fruit he had used was that of the ordinary mango. It was first peeled and then sliced—about five slices being yielded by one fruit. It was then placed upon trays in the sun to dry, care being taken to allow free circulation of air. No sugar was used, and after two days the fruit was placed in double paper bags. Mr. Roberts thought that mangoes dried in this way might perhaps be placed on the mainland market to be used in the same way as dried apples. He thought that the trees on his own premises could produce a thousand pounds of dried fruit each year.

The third paper of the evening was then read:

FRUIT CULTURE AN INDUSTRY IN HAWAII.

BY JARED G. SMITH.

Special Agent Hawaii Experiment Station.

A recent editorial in one of the leading fruit journals of the mainland summarizes the development of the fruit trade of the United States and draws from this summary the conclusion that the consumption of fresh fruit by the people of the United States is increasing in a ratio out of all proportion to the increase in population. In other words the people of the United States are fruit eaters, and the market is limited only by the quality of the fruit offered, and by the purchasing ability of the people who buy. The fruit consumption of the mainland amounted to upwards of \$140,000,000 during the fiscal year 1905. The value of the orchard fruits was estimated at \$85,000,000; of berries and small fruits \$20,000,000; of tropical fruits from Mexico, Cuba and other Spanish-American countries \$25,000,000; \$2,000,000 worth from Hawaii and Porto Rico and about \$8,000,000 worth from foreign countries. The strawberry crop alone was valued at \$15,000,000, and the sum invested in fruit baskets, boxes and crates amounted to over \$7,000,000.

The development of the tropical fruit trade between Hawaii and the mainland depends in the first place upon the quality of the fruit offered; second, the style and method of packing for shipment; third, upon the efficiency of the transportation service between Hawaii and the mainland, and fourth, upon advertising, in order to bring home to buyers the merits and excellence of the Island products.

The Hawaii Experiment Station inaugurated shipping experiments in 1904 with alligator pears and mangoes. A number of crates of both of these products were shipped in cold storage to New York City, the larger portion arriving in marketable condition, although some were a complete loss. The commission merchants who received our fruit stated that the pears which came through in good condition were of better style and quality than alligator pears sent to the New York markets from the West Indian ports. Another shipment was made to the Philippines per Government transport and these were reported as having been received in sound condition. Although experiments were repeated in 1905, only a small part of the pears reached destination in good condition. On August 1, 1906, Mr. J. E. Higgins, horticulturist of the Station, shipped about five tons of pineapples, papaias, bananas and alligator pears to San Francisco, himself accompanying the shipment, in order that he might make personal studies of transportation, packing, handling and marketing Hawaiian fruits. I have just received a report from Prof. C. C. Georgeson, director of the Alaska Experiment Station, acknowledging the receipt of a case of pineapples. This particular case did not reach him in very good condition, but he expresses surprise to find out that the Alaska market is only 25 days from Honolulu. Other crates of fruit were shipped to Portland, Tacoma, Seattle, Spokane, Helena, Reno, Salt Lake City, Denver, Omaha and Washington, D. C. Practically the entire consignment was marketed and distributed outside of California. With the exception of the Alaska shipment favorable reports have been received in regard to the condition of the whole consignment.

Upon Mr. Higgins' return he will undoubtedly be able to report to you in greater detail in regard to the practical points connected with the shipping and marketing of Hawaiian fruits.

The creation of a demand for fruit is of as great importance as the economical production of the fruit itself. When we con-

sider that the people of the mainland not only consumed \$105,000,-000 worth of home grown fruit, but paid an additional \$35,000,000 for tropical and sub-tropical fruits, the often repeated prediction that Hawaii is liable to glut the market if production continues unchecked, becomes almost an absurdity. I will lay it down as a law, that good fruit, and especially good tropical fruit, can always be sold in the American markets at good prices, if laid down at the point of consumption in first-class condition. The mainland consumption is increasing at the rate of \$20,000,000 a year, and as stated above bears no relation to mere increase in population. The Pacific coast market is nearer to Hawaii than the London market is to Jamaica, and yet the fruit trade of Jamaica has increased during the last ten years to such an extent that it is now the principal industry of that island. I believe that the fresh fruit trade of the Pacific North West coast is capable of almost indefinite expansion, and belongs more justly in so far as bananas, pineapples and alligator pears are concerned to Hawaii, than to lower California, Mexico and Central America, which countries are already reaching out for this trade. Whether Hawaii can take and keep the Pacific Coast market for tropical fruits depends very largely on the push and enterprise of Hawaiian fruit-growers.

After some interesting discussion upon Mr. Smith's paper, the reader announced that the success which had been achieved by Mr. Higgins upon his visit to the mainland to investigate the conditions upon the Coast for marketing Hawaiian fruit and giving them publicity, had been so encouraging, that although the present would ordinarily terminate the Institute's meetings for the year, in view of the importance of the subject, with the consent of those present a special meeting would be held in order to allow Mr. Higgins to report upon what he had achieved. This proposition met with general agreement and it was determined to hold another meeting in about two months, when Mr. Higgins will have completed his work and will have returned. As the hour was late, upon motion of the chair it was decided in view of the absence of the author to defer the paper upon insects affecting the fruit industry until the special meeting. Mr. D. L. Van Dine had prepared a number of mounted specimens for exhibition and it was felt that more justice could be done to this important subject when it could be presented by the author. The meeting then adjourned.

ENTOMOLOGICAL NOTES.

From the Division of Entomology, Board of Agriculture and Forestry.

BY JACOB KOTINSKY.

THE RECENTLY INTRODUCED DUNG FLY PARASITE.

(*Eucoila impatiens*, Say.)

In his search for useful insects for the Territory Mr. Koebele is now concentrating his attention on the horn fly, taking enemies of our other pests, as Avocado pear scale and cut worms, incidentally. Nearly every steamer from the coast brings a large consignment of these insects for breeding and distribution. On the 5th of May, of this year, the "Alameda" brought, among other things, a box with dipterous pupae collected in dung. They were packed in sphagnum moss and kept at about 40° F. aboard the steamer. In the laboratory they were gradually brought to our normal temperature and then segregated and put away for breeding. A little less than a month later males and females of the above named parasite began to issue. They were immediately supplied with a large jar full of cattle droppings well stocked with dipterous larvae and pupae habitually inhabiting it. As fast as other specimens of the parasite issued they were placed in this jar. Twenty-five days later a large brood of the parasite made its appearance in the jar and systematic distribution among ranchmen on the Islands and at the heads of the valleys in the vicinity of Honolulu immediately commenced. A portion of the brood was retained and two fresh jars stocked with it for further breeding and distribution. So far as we are aware all stock breeders on the Islands, with the exception of a few, have by now been supplied with colonies of the useful insect. The material from which this lot of parasites was bred was collected by Mr. Koebele in the vicinity of Alameda, but it has also been bred from pupae more recently received which Mr. Koebele sent from Nogales, Arizona.

For naming the fly we are indebted to the U. S. Bureau of Entomology, Washington, D. C., where it was named by Dr. Wm. H. Ashmead.

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DESCRIPTION.

The insect was originally described by Thomas Say in the Boston Journal of Natural History, vol. I, page 268, 1835, as *Figites impatiens*, from specimens collected in Indiana. This description is copied below for reference and is given in smaller type so that those not specially interested may omit reading it.

"F. Impatiens.—Black: mandibles and feet piceous.

"Inhabits Indiana.

"Body polished black: antennae piceous-black, two-thirds the length of the body, with scattered hairs: beyond the sixth joint moniliform: terminal joint ovate conic: mandibles piceous, area of the stemmata a little elevated: behind which, on the occiput, are oblique impressed lines: scutellum with the margin depressed and rugose, the disk oval, the edge obscurely piceous, with an indentation behind, within the edge: wings hyaline: nervures yellowish: feet piceous.

"Length three-twentieths of an inch."

Any one who has first observed the males and females will not confuse them again, as the antennae of the former are about three times as long as those of the latter, this being the most conspicuous character.

BEHAVIOR.

The insect flies readily and also moves about in the dung with perfect ease. The female is armed with an ovipositor nearly as long as the entire insect. This organ is normally hidden in the body and is withdrawn when eggs are laid. When extruded it curves forward beneath the body and pierces through substances while reaching out for its host within which one or more eggs are deposited. Both larva and pupa of dung flies are attacked nor is preference shown for any particular species of fly, provided it is a dung inhabitant. The egg so laid hatches within the host and the resultant grub feeds and grows at the expense of the host substance surrounding it. It reaches maturity within the latter's integument and when fully formed emerges through the aperture made by gnawing off an end of the pupa. The fly larva even when parasitized attains the pupa state so that the parasite invariably issues from that state of the fly. The parasite is so large when compared with the horn fly pupa that it was doubted at first whether the latter would be subject to attack, but upon confinement with pupae of this fly it was observed to oviposit in them and the parasite was subsequently bred from them.

NATURE AND EXTENT OF USEFULNESS OF THE PARASITE.

It is now beyond doubt that the parasite does and will attack the horn fly larva and pupa in its way, though it will probably show preference to the larger hosts breeding in the same medium. But even in the latter event it cannot but prove useful, both directly and indirectly. Directly by reducing the numbers of the larger flies that inhabit cattle droppings. Indirectly by reducing the numbers of the larger maggots and pupae as a source of food to the mynah bird and other predators and thus compelling them to feed on the smaller fry, including horn fly larvae and pupae. No opportunity was yet open to ascertain whether the parasite has been established on the Islands, but judging from the facility with which large numbers were bred in confinement the certainty of its ultimate establishment on the Islands is a safe assumption. Once established much of the success of its introduction will depend upon the intelligent manipulation of the various ranch managers and owners in distributing parasitized pupae over their respective lands.

A CORRECTION.

Advantage is here taken of calling attention to a serious typographical error that appeared in the last (1905) "Proceedings of the Hawaiian Live Stock Breeders' Association," on page 77. For the first line beneath the illustration on that page read "This *lantana* enemy (Fig. 8) was *not* introduced by Mr. Koebele." Other errors of similar nature abound in the author's notes in that publication, but since these notes are to reappear in identical form in the forthcoming report of the Board, with errors corrected, they will not be referred to here.

RICE HARVESTING MACHINERY.

We are in receipt of some excellent illustrations together with a description of the recent experiments which Mr. F. G. Krauss of the Hawaii Experiment Station has been lately conducting with rice harvesting machinery. The whole will be published in the November issue.

REPORT ON HORTICULTURAL QUARANTINE
INSPECTION WORK.

To the

Honorable Board of

Agriculture and Forestry,

Honolulu, T. H.

Gentlemen:

Since my report to you, dated August 8th, I have the following brief summary of the work of my division:

On August 6th the S. S. "Hong Kong Maru" arrived from China, having on board twenty-five (25) boxes of rubber stumps (*Hevea Brasiliensis*) from Ceylon, consisting of 30,000 plants that had been over five months detained in a warehouse in Colombo and on the voyage, so that upon their arrival here they were dried up and were in such bad condition that the importers abandoned the consignment and it was put up for sale by the Custom authorities on August 15th and bought in by me for five dollars. After fumigation and destruction of the soil, those showing any signs of life were planted in the Government Nursery and now nearly 300 give evidence of growing.

During my vacation—kindly granted by you—Mrs. Craw and I spent two weeks at the Volcano House on Hawaii and had a most enjoyable and beneficial outing.

On my visit to Hawaii I spent two days at Hilo with Mr. Matthias Newell. Previous to my going up to the Volcano House I gave instructions regarding the construction of two fumigating outfits for Hilo, one for the dock and the other for the post-office, and in the event of any infested plants or seeds arriving there, will be treated by Mr. Newell.

During my absence Mr. Kotinsky assisted Mr. Austin along the front in inspection work. The S. S. "Miowera" arrived on August 21st and a passenger from Fiji had a collection of choice seedling sugar cane cuttings, that were found to be infested with leaf-hopper eggs. The cane was fumigated to destroy any insects that had hatched on the voyage. The cane was subsequently burned as there was grave danger of fungi diseases being present. I have to endorse the action of the above named gentlemen in preventing the possible introduction of fungi diseases in sugar

cane as such are much more insidious in their work on vegetation than most other pests and certainly more difficult to combat.

During this time Mr. Kotinsky has been industriously breeding and distributing colonies of beneficial insects for horn flies, also others preying upon scale and other injurious insects. Several valuable colonies of useful insects have been received from Prof. Koebele, collecting in Arizona, and now in Mexico. Other useful insects have also been received from Mr. Compere from China and are being attended to by Mr. Kotinsky.

Since my return Mr. Austin and I have been almost constantly employed in the fumigation of large importations of infested rice from Japan (15,736 sacks). Carbon bisulphide was successfully used in tight fumigating rooms on the quarantine wharf after which the rice was put through the polishing machinery. An extra strong application of hydrocyanic acid gas was applied in one large room, but was not as successful as the carbon bisulphide and had to again be treated with the latter fumes. The rice importers cabled instructions to their agents not to ship any more rice unless it had been treated or put through the mill. The only lot received since was a few thousand sacks on the delayed S. S. "Mongolia" that had sailed before receipt of the cable instructions.

The Collector of Customs, under instructions from the Secretary of the Treasury, withheld delivery of the rice until it was thoroughly fumigated.

Since my last report fifty-five (55) steamers and sailing vessels arrived in port from outside the Territory, bringing one hundred and thirty-four thousand five hundred and ninety-four (134,594) packages of fruits and vegetables. This does not include the 15,736 sacks of rice we fumigated. During the same period we inspected one hundred and thirty-seven (137) packages by mail. The reason for this large invoice by mail was the receipt of fifty (50) packages of Cacao plants from the Department of Agriculture, Washington, D. C., and thirty-five (35) packages of sisal plants, (210) from the same place. The former had been treated with Bordeaux mixture, but had some living mealy bugs; these and the sisal plants were fumigated here with hydrocyanic acid gas. Four (4) large cases of plants also came in and were carefully inspected and fumigated.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

BY AUTHORITY.

Notice is hereby given that G. H. Moore, Esq., has been appointed Assistant District Fire Warden for Nuuanu and Pauoa Valleys, District of Kona, Island of Oahu.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that E. E. Conant, Esq., has been appointed District Forester and District Fire Warden for the South half of the District of Kohala, Island of Hawaii.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that John T. Moir, Esq., has been appointed District Fire Warden for that portion of the District of Hilo, Island of Hawaii, extending from the land of Makahanaloa to the land of Kikala.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that Augustus F. Knudsen, Esq., has been appointed District Forester and District Fire Warden for the District of Napali and that portion of the District of Kona, formerly known as the District of Waimea, lying to the West of the Waimea, Poomau and Kauaikanana Valleys, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Notice is hereby given that Francis Gay, Esq., has been appointed District Forester and District Fire Warden for that portion of the District of Kona, lying between the Waimea, Poomau and Kauaikanana Valleys on the West and the Hanapepe Valley on the East, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Notice is hereby given that Walter D. McBryde, Esq., has been appointed Co-District Forester with Rev. J. M. Lydgate for that portion of the District of Kona, lying to the East of the Hanapepe Valley, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry for 1905; 240 pp.; plates 8; text figures 8.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

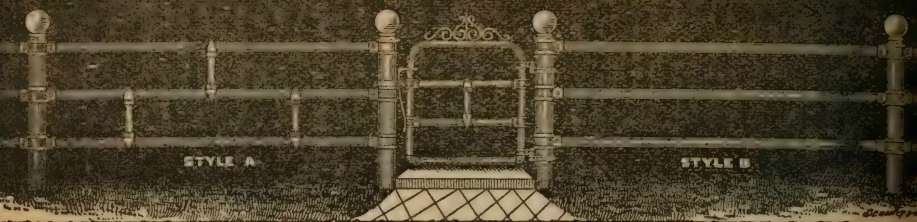
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

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Manager The Mutual Life Insurance Company of New York.

DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. III.

NOVEMBER, 1906

No. 11

The organization of various local improvement societies throughout Honolulu some months ago was instrumental in effecting a great advance in the standard of street and lot appearance of the city. The fostering of civic pride can be achieved in no more direct way than by the encouragement of a friendly emulation to enhance the beauty of natural resources. Attendant with the awakening of a pride in the beauty of environment follows a train of beneficial results which go far to the development of a country's material prosperity. Among those which are most readily suggested, may be mentioned the encouragement of an appreciation of natural beauty, leading to the development of higher ideas, the widening of the intelligence and mental horizon, and the inculcation of principles making for contented and happy homes.

During the past month, among other advances in local improvement which have been noted, the planting of the avenue of golden shower trees on Pensacola street, and the clearing of the vacant lot near the entrance to Punahou College—a work which is still in progress—are particularly to be commended. We trust that the excellent progress which has already been made will steadily continue until our city may be in fact, the most beautiful of the tropics. In this, as in almost all other work, there is no time of final accomplishment, but each new year and generation must carry on what has been so well begun.

The work of the Hawaii Experiment Station ranks among the chief factors which are making for the stable prosperity of the agricultural industries of the Territory. In connection with the experiments now being undertaken to develop a new breed of rice suited to the peculiar needs of the islands, and to improve the local cultural and harvesting methods of the rice crop, we present this month a series of illustrations together with a descriptive letter from Mr. Krauss, who is conducting the investigations, which should prove of exceptional interest to our readers.

A system of cultivating vacant lots has, for some years, been in operation with excellent results in certain mainland cities. According to this plan a "Vacant Lots Cultivation Association" is formed of such people as are interested in the movement and desire to help it forward. The association takes over for cultivation and improvement all vacant lots from owners in sympathy with the work, on an agreement to surrender them upon demand. The association then prepares the ground for cultivation and allots it to desirable tenants. It also exercises supervision over the gardeners, provides them with seed and fertilizer (in the form of street sweepings), sells or in some cases lends them tools, offers them general advice when needed, and also reserves the right to take away any lot which does not come up to the standard of efficiency and appearance or whose tenant does not work in harmony with his neighbors. The gardeners receive the use of their land without payment subject to the surrender agreement, and are entitled to the whole produce of their labor. The system referred to is productive of an "intense" system of horticulture, in which every foot of available ground is rendered productive. If this system were inaugurated in Honolulu it might be deemed advisable in some neighborhoods to restrict the gardeners to flower growing, but in any case the plan would be beneficial with respect to many vacant lots which are more or less outside the present local improvement societies. The land not far from the Young Hotel, covered with a labyrinth of wooden fences, would certainly look more attractive if it were filled with brightly colored flower beds. Many other lots now lying idle could be greatly improved and be made remunerative to such citizens as have sufficient energy and application to work them properly. The best way to give assistance is to do so in such a way as to teach self-help, and in view of the many industrious people of Honolulu not too greatly overburdened with this world's goods, few better ways of help could be devised than the one proposed. The Hawaiians are proverbially fond of flowers and among them are many whose chief source of income is derived from the sale of leis. To many of these, no doubt, a flower plot accessible to the market, and to be obtained solely by an agreement to work upon it regularly and keep it attractive, would be greatly appreciated.

RICE HARVESTING MACHINERY.

Honolulu, Hawaii, Oct. 21, 1906.

Mr. L. G. Blackman,

Editor The Hawaiian Forester and Agriculturist,
Honolulu.

Dear Mr. Blackman: As per your request, I enclose herewith negatives of two rice harvesting scenes—Chinese harvesting rice by hand, and a self-binding harvester in operation in our trials, October 18, 1906.



At this second trial of the rice harvester by the Hawaii Agricultural Experiment Station, with conditions in the field not so favorable as they often are, it having rained the night previous to the trial, and also during part of the time while the machine was in operation, very satisfactory results were achieved.

The particular machine used in our trials is what is termed a McCormick Self-binding Right-hand Rice Harvester, with five-foot cutter-bar, a machine especially designed to meet the requirements of rice growers in Louisiana and Texas. It is largely due to this labor and time-saving implement that the rice industry of the Gulf States has been so greatly extended and made profitable.

The rice-binder does not differ materially from the ordinary grain binders used throughout the United States. The main wheel is somewhat higher and broader and in addition is provided with long lags to secure the necessary traction in soft, yielding soil, and such parts as are directly exposed to the mud and water of the rice fields are galvanized to prevent rusting.

The harvester used in our trials cuts a swath five feet wide, but machines making six and seven-foot cuts are commonly used in the Southern rice belt. Two to three strong horses are required to draw the smaller machines, while as many as five horses are used to the larger machines, depending upon the stand of grain and condition of the ground.

One man drives and operates the harvester, which cuts the standing grain at any desired height, gathers it into bundles of desired size and ties each securely with a band of manila twine, collects the bundles in a carrier and dumps them in piles of three, four or five. A man or two following shocks the bundles to dry and cure.

The binding mechanism on the modern self-binder is a marvel to all first beholders. As the cut grain falls upon the platform canvas, it is delivered to the binding attachment, between the elevator canvases,—the butts of grain are evened as the packers quickly gather the grain into bundles, and the curved needle darts in a half-circle round the tightly clasped





bundles, a perfect knot is tied and the well-rounded sheaf is discharged to the carrier from where it is dropped to the ground at the will of the operator.

Under favorable conditions, the five-foot cut machine will cover five to eight acres a day, which is equivalent to the hand labor of twenty-five to forty men.

While not adapted to all Hawaiian rice fields, our last trial has demonstrated that on such lands as can be drained sufficiently to permit of horses keeping a comfortable foothold, the modern self-binding harvester can be made a useful aid as a time and labor saver.

Very truly yours,

F. G. KRAUSS,
In Charge of Hawaii Rice Investigation.

BY AUTHORITY.

ARBOR DAY PROCLAMATION.

In accordance with the custom inaugurated last year of setting apart a day for the promotion of forest growth, I hereby designate Friday, November 2, 1906, as Arbor Day for the Territory of Hawaii, recommending that appropriate exercises be held in the public schools and that a part of the day be devoted to the planting of trees and shrubs upon the school grounds.

(Seal)

Given under my hand and the Great Seal of the Territory of Hawaii, at the Capitol Building in Honolulu, this twelfth day of October, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

REPORT OF HORTICULTURAL QUARANTINE
INSPECTION WORK.

Honolulu, T. H., October 31st, 1906.

To the Honorable Board of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen: During the month of October seventeen (17) steam and sailing vessels arrived from outside this Territory on which we found thirteen thousand, five hundred and fifty-one (13,551) packages of fresh fruits and vegetables, seven (7) cases of plants, two (2) barrels of seed and fifty-four (54) packages of plants and seeds by mail. A few lots found attacked by fungi diseases or insect pests have been destroyed or fumigated with carbon bisulphide or hydrocyanic acid gas.

Since my last report, October 3rd, we have fumigated three thousand three hundred and fifty-eight (3,358) sacks of old crop rice, using fumes of carbon bi-sulphide. The above chemical was exhausted in town owing to the previous heavy fumigation of infested rice and a fresh supply arrived ex S. S. "Hilonian" on October 21st.

On October 9th Mr. C. J. Austin, after repairing the orchard fumigation outfit, commenced the treatment of the scale infested Moanalua Indian mango trees that were imported four years ago and planted without fumigation. The fumigation of the trees was done at night on account of less danger by actinic rays; even with that precaution a slight injury was done the very tender foliage; this, however, was not lasting as since the fumigation the trees have all put on a healthy vigorous new growth, and on careful examination we failed to find a single living scale.

On October 20th Mr. Kotinsky received a twig of "Norfolk Island pine" from Kauai infested with small "Araucaria scales" (*Pseudococcus aurilanus*). Mr. Kotinsky replied and made inquiry regarding its introduction and received a reply that he had received a few small Araucaria trees from a nursery in the East and from a firm in San Francisco and is of the opinion that it was on the latter trees the scale came by mail. The owners dipped the two small trees in "whale oil soap" solution.

He again sent samples of a twig to which Mr. Kotinsky replied on October 30th, "that all the scales on the twig were dead, from which I conclude your dipping in soap solution was effective." The next visit of one of your entomologists to that island a thorough inspection will be made to see that it has been completely exterminated there.

From Japan came fourteen small tea plants on which I found traces of a white wax scale (*Ceroplastes*); after destroying any that had evidence of that scale the others were fumigated with hydrocyanic acid gas and will be held in quarantine to watch developments.

A Customs inspector intercepted a small package of rolled pearl barley being taken from the Japanese training ship "Aragawa." Acting Collector Stackable notified me and Mr. Austin and I visited the training ship and looked through the stores and found the above grain infested with "rice weevils" (*Calandra oryza*). We brought the matter before the officer of the day and he issued orders to the sailors and members of the crew not to take any of that barley ashore. This is a cosmopolitan beetle and is found on the Islands.

Mr. Kotinsky makes the following report upon beneficial insects received from Prof. Koebele during his recent explorations in California, Arizona and Mexico:

May 5, 1906. Consignment No. 19.

Name.	Enemy of.	From.	Disposal.
Chalcid	(Mealy bug) ..	Alameda, Cal.....	Bred.
Coccinellidae	(Mealy bug) ..	Nogales, Ariz.....	Bred.
Histers	(Horn fly)	Nogales, Ariz.....	Released.
Proctotrupids.....	(Horn fly)	Nogales, Ariz.....	Bred and released.
Seymnids	(Mealy bug) ..	Alameda, Cal.....	Bred.

May 25, 1906. Consignment No. 20.

Seymnids

(Mealy bug) ..	Alameda, Cal.....	Bred and released.
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August 11, 1906. Consignment No. 21.

Dung maggots.....

(Horn fly)	Alameda, Cal.....	Bred and released.
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August 29, 1906. Consignment No. 25.

Calosoma sp.....	(Cut worms) ..	Nogales, Ariz.....	Released.
Histers and larvae...	(Horn fly)	Nogales, Ariz.....	Bred and released.
Manure beetles.....	(Horn fly)	Nogales, Ariz.....	Released.

September 7, 1906. Consignment No. 27.

Calosoma sp.....(Cut worms).. Nogales, Ariz..... Released.
 Chilocorus caeti.....(Scale bug)... Nogales, Ariz..... Released.
 Exochomus pilatei... (Mealy bug)... Nogales, Ariz..... Released.
 Manure beetles.....(Horn fly).... Nogales, Ariz..... Released.
 Histers and larvae... (Horn fly).... Nogales, Ariz..... Bred and released.
 Horn fly parasites... (Horn fly).... Nogales, Ariz..... Bred.
 Phanacus (?) sp.....(Horn fly).... Nogales, Ariz..... Released.

September 19, 1906. Consignment No. 28.

Amara sp.....(Horn fly).... Nogales, Ariz..... Released.
 Calosoma sp.....(Cut worms).. Nogales, Ariz..... Released.
 Chalcaspis sp.....(Mealy bug).. Nogales, Ariz..... Released.
 Hemerobiids(Scale bug)... Nogales, Ariz..... Bred and released.
 Histers and larvae... (Horn fly).... Nogales, Ariz..... Bred and released.
 Horn fly parasites... (Horn fly).... Nogales, Ariz..... Bred.
 Hyperaspis lateralis..(Scale bug)... Nogales, Ariz..... Released.
 Manure beetles.....(Horn fly).... Nogales, Ariz..... Released.
 Syrphus flies.....(Scale bug)... Nogales, Ariz..... Released.

September 28, 1906. Consignment No. 29.

Amara sp.....(Horn fly).... Nogales, Ariz..... Released.
 Chalcaspis sp.....(Mealy bug).. Nogales, Ariz..... Released.
 Hemerobiids(Scale bug)... Nogales, Ariz..... Released.
 Histers(Horn fly).... Nogales, Ariz..... Released.
 Manure beetles.....(Horn fly).... Nogales, Ariz..... Released.

As requested by you a public exhibition of some of the principal beneficial imported insects—enumerated above—was made. They were arranged in an exhibit case by Mr. Kotinsky and space was kindly given by Messrs. McInerny in one of their windows, corner of Merchant and Fort streets, where they attracted general attention of the residents and visitors to Honolulu.

Respectfully submitted,

ALEXANDER CRAW,
 Superintendent of Entomology and Inspector.

WHAT RUBBER TREES CAN BE PLANTED IN
HAWAII?

PEHR OLSSON-SEFFER, PH. D.

*Director, La Zacualpa Botanical Station and Rubber Laboratory,
Mexico.*

Ever since Charles Goodyear's discovery rendered the rubber of practical use to mankind the tropical forests have been scoured by the natives and by white men searching for rubber-producing trees. Along the Amazon River and its tributaries the seringueiro of Brazil hunts for the rubber of this immense territory, and he sometimes goes as far as the slopes of the Andes. In Peru, Ecuador, Colombia and Venezuela, a diligent search is made for rubber. All through the Central American republics and Southern Mexico, the native ulero taps the indigenous rubber trees which are now rapidly decreasing in number. In West and East Africa the negro collectors bring in immense quantities of rubber for the benefit of the white traders. In East India, the Malay Peninsula and on some of the South Sea Islands, wild rubber is collected. Everywhere, however, the amount is decreasing, that is, we should rather say the natural supply is not sufficient for the steady increase in the demand of crude rubber.

This fact, as well as the high prices obtained for rubber has induced capital to take an interest in the development of rubber planting as an industry. It is still more or less in the experimental stages, but sufficient results have been obtained to demonstrate that rubber planting, when conducted properly, is a very lucrative undertaking.

The question what rubber plants should be cultivated in certain localities must be determined, besides by the quality of the rubber obtained, by local and climatic conditions. It seems as if it would be rather difficult to make a choice from the great number of rubber yielding plants which are known so far. The concerns which have undertaken rubber planting are still so young that it is not possible to draw more than general conclusions from the results, except in the case of a number of rubber estates in Ceylon and the Federated Malay States, where accurate data can be secured.

Although many points have been advanced for the profitability of this or that rubber plant in preference to others still all inferences so far have been based on limited experience only. What rubber tree is the best to plant in Hawaii can naturally not be decided upon before more evidence has been obtained. We can only draw some general conclusions by comparing the climatic and soil conditions here with those of other countries, where rubber cultivation has reached a more advanced stage, as well as with the conditions obtaining in places where the various rubber plants grow wild. The conditions under which a plant develops in its natural surroundings give the observer a number of points, but it is always difficult to recognize correctly all such conditions existing so that others can be compared with them. Any comparisons of this kind must be confined to districts in which similar soil conditions prevail, if they are to be in any way correct.

It is in the tropical zone from about 25° North latitude to 25° South where the rubber producing plants grow. Within this belt the general climatic conditions are more or less similar, although naturally local variations sometimes are considerable. We can say that in this zone the temperature varies from 75° to 110° Fahrenheit, and that the average rainfall is about 80 inches. If we make a comparison between Hawaii and other rubber producing countries we find that this Territory is very close to the northern limit of the natural rubber zone. Roughly speaking, these islands are situated between $19^{\circ} 10'$ and $22^{\circ} 25'$ North latitude. Now Cuba, for instance, is located between 20° and 23° and it is very doubtful whether rubber can be grown profitably in that island. Haiti is situated between 18° and 20° North latitude and rubber has not yet been a success. Jamaica and Porto Rico lie between 18° and $18^{\circ} 30'$, and rubber culture there is of no significance, nor has it been very successful where tried. In Mexico the northernmost point where rubber is being grown commercially is Tierra Blanca at 18° , but the rubber at that place is not what it ought to be. The Isthmus of Tehuantepec is generally considered as a good rubber producing district and it does not reach further north than 16° . In the State of Chiapas, in Mexico, which lies between 15° and 16° North latitude, is the home of rubber in Mexico. Guatemala goes as far north as 17° , but in the northern districts wild rubber is not common. The countries in the Orient where rubber culture has proved a success are Ceylon, between 6° and 10° North latitude, and the

Malay Peninsula reaching from the Equator to about 10° North. In the Philippines, the Island of Luzon is situated between $12^{\circ} 20'$ and 18° . This island is generally not considered to be suitable for rubber, while Mindanao is referred to by the Manila authorities as the true rubber country. These data are not inductive to a favorable opinion as to the future of rubber in Hawaii. Still it is generally known that on account of the insular climate prevailing in these islands, most tropical plants succeed extremely well. It has also been demonstrated that certain rubber producing trees flourish in suitable locations in these islands and it may be safe to say that in a very few selected localities rubber will become a commercial success.

The question then arises which species of rubber is the most profitable to plant. We would without hesitation say *Hevea brasiliensis*. The Ceara rubber is the one which has been most extensively experimented with in these islands and its growth has been truly remarkable. Now, it is a fact, however, that the Ceara has been planted in locations with plentiful rainfall and under such conditions it always makes a good growth. As for the actual results in yield of rubber we must reserve our opinion until proofs have been obtained.

In a few places where *Castilla* has been grown in the islands the young seedlings are doing well, but this does not prove anything as regards its future. The *Ficus* of East India is not likely to become a rubber yielder in Hawaii, for many reasons. Even in its native country it does not produce rubber profitably before it has reached a rather advanced age, from 18 years upwards. It is further a native of a very warm tropical country. That it grows fairly well in certain places in these islands does not prove that it would be advisable to plant it for commercial purposes. It also grows well in pots all over the United States and Europe. It must reach a very large size if it is to become commercially important. There is another species of rubber which should be tried in Hawaii, as its natural habitat shows a certain similarity to conditions here. This is *Sapium tolimense* of Colombia. This tree grows very rapidly, it produces a good kind of rubber, and it stands a comparatively low climate as it occurs naturally at an elevation up to 7000 feet. The *Hancornia*, which gives the Mangabeira rubber of Brazil, is a very slow growing tree, difficult to cultivate, and it would hardly be a success here.

When we consider these different rubber trees we find that the

planter in Hawaii has to confine himself to four species, the *Hevea*, the *Manihot* or Ceara rubber, the *Castilla* and the *Sapium*. We shall briefly refer to the requirements of the three former plants.

The main difficulty in establishing a *Hevea* rubber plantation is the matter of obtaining seeds. On account of the extensive cultivation now being made in Ceylon, and in the Orient generally, the demand for seed is very great and orders have to be booked months ahead. Then comes a long transportation during which the seeds are packed and the germination kept back. When the consignment finally reaches here it is found that a great number of seeds fail to germinate, and even when germination has taken place the development of the plant is for some time very slow. At Nahiku, on Maui, where a quantity of *Hevea* has recently been planted the growth of the seedlings was for a long time very slow, until the plants became thoroughly acclimatized. The best source for obtaining *Hevea* seeds for these islands is naturally Singapore.

As regards the planting of *Hevea* in Hawaii it would be advisable to plant rather close, say 10x10 feet. This will give opportunity for selection and from time to time a thinning of the inferior trees should be made. It will always be found to be more advantageous to plant close at a start than to have to replace failures. During the first years of its existence the *Hevea* tree grows mainly in length and its rapid increase in growth is not noticeable before the tree has reached an age of about three years. In Ceylon, a growth of about 6 to 10 feet in height every year for the first three or four years is considered the average. The circumference of the stem at three feet from the base in a two-year-old tree varies from 2 to 8 inches. A very important factor in rubber cultivation is the development of a good root system. In 6 to 7 years the lateral roots of trees planted at a distance of 10x10 feet may be expected to meet. If shade trees have been planted during the first few years these should give room for rubber alone as soon as crowding commences. The question of planting any catch crops between the rubber is still a debatable one. With the system of clearing which apparently is the best in Hawaii, that is strip clearing, no inter or catch crops could be grown.

The Para seedlings develop best if slightly shaded for the first and second years. After that time they grow satisfactorily with-

out shade. Windbreaks will very likely be necessary everywhere in these islands. As the native forest does not produce sufficient shelter, wind belts of *Grevillea* or *Albizzia* should be planted. It may be found advisable to plant *Albizzia moluccana* between the rubber trees and keep them pruned down so that the rubber at an age of two years will outreach the tops. In that manner the *Albizzia* would be covering the ground and at the same time supplying green manure to the soil.

In planting *Hevea* seeds in the nursery it is a good plan to add to the soil a mixture of cattle manure and leaf mold, in which case a much improved growth would be apparent. In Ceylon the young seedlings are attacked by a number of enemies such as rats, hares, etc. To keep these animals away the young plants are often enclosed in rabbit wire netting. When rabbit netting is used for individual plants they are surrounded by a circle of netting, about 6 to 9 inches from the plant and of a height of three or more feet. In making holes for the final planting of these seedlings it is a good plan to give the plant plenty of room. The larger the holes the better, as the *Hevea* is a very greedy feeder.

It is a well known fact that the *Hevea* does not necessarily require a very rich soil. This refers also to other rubber trees with the exception of *Ficus*. The main requirements as regards soil is good drainage and deep soil with sufficient subterranean water supply. It may be found that the Hawaiian soils are rather too acid and require liming. The question of fertilizing the soil for rubber is as yet unsettled as very few experiments have been made. When the cover of Para trees is once established the soil will keep on improving on account of the action of the roots and the natural accumulation of leaf mold. Green manure has been tried and the plants respond readily.

The superiority of *Hevea* above other rubber producing trees has been amply demonstrated in Ceylon. This tree is comparatively hardy and permits a system of tapping which invariably would destroy both *Castilla* and *Manihot*. The multiple tapping which is practiced on *Hevea* gives ultimately a considerably larger amount of rubber per tree than can be obtained from any other plant. From that point of view cultivation of *Hevea* is the most profitable. Tapping *Hevea* is, however, connected with much work and where labor is expensive this tapping becomes a serious item. In comparison the tapping of *Castilla* is cheap, because it

needs to be done only a few times during the season, and a proportionately greater amount of rubber is obtained at each tapping.

In regard to methods of cultivation *Castilla* needs the same care as *Hevea*. It is not necessary to sow the seeds in a nursery. Being comparatively cheap a larger number of seeds can be planted at stake and thinning done subsequently. Experience has proved this to be the best plan for planting *Castilla*. The tree can be easily propagated from cuttings, but seed plants are preferable as they are stronger and live for a longer period. Both *Hevea* and *Castilla* have to be pruned in order to secure single straight trunks with the largest possible tapping area. Both are almost equal in regard to injuries by insect or fungus attacks. In this regard *Ceara* rubber is more liable to damage. The young seedlings are attacked by numerous enemies as both roots and leaves contain a large amount of starch which is naturally sought for by various animals.

The seeds of *Castilla* are somewhat difficult to transport over long distances, but by packing in slightly moistened charcoal they can retain their germinating power for months. In obtaining seeds of *Castilla* it is important to know the origin of the seeds as there are many varieties of this tree which are non-productive or produce only a limited amount of rubber. The best variety is *Castilla lactiflua*, originally described from La Zacualpa, in Mexico. In sowing these seeds they should be only slightly covered with light soil. If planted too deep germination will be considerably retarded. *Castilla* can be planted at the same distance as *Hevea*, that is about 10x10 feet. Thinning has to be done from time to time.

There are very few localities on the Hawaiian Islands which seem suitable to *Castilla*. Where such conditions obtain, that is, where the temperature is about 74° Fahrenheit and the rainfall not more than 80 inches, the *Castilla* should do well. It cannot be grown profitably above an elevation of 500 feet and it requires good shelter as the leaves are very liable to injury from high winds.

In regard to *Manihot* seeds they are easily obtainable and can be held for several years without losing their germinating power. It has been proved that seeds kept in a dry place for two years germinate better and give stronger seedlings than recently picked

seeds. If not filed or prepared in other ways the seeds do not generally germinate for a long time. Sometimes they lie in the ground over a year. The generally adapted method to assist germination is to file the seed. This is very laborious and experiments have proved that the seeds can be made to germinate in eight days, by the following method:

Place a layer of fresh horse manure in a box, to the thickness of about 6 inches, spread the seeds on this surface and cover with about one inch of the same material mixed with a small quantity of sand. The soil should be slightly packed and the box covered with glass. If put in a warm place or in the sun germination will take place very quickly. The seedlings should be planted as soon as they are an inch or two high and some manure added to the soil. After such a treatment the seedling will grow very rapidly. In planting at stake the holes should be made as large as possible, or at least four feet square. The soil should be well weathered and if too sour some lime should be added before planting.

The *Cereia* rubber tree needs no special care besides the cleaning of the soil. In some instances the trees have to be pruned if branching too early. Generally it can be said in regard to any kind of cultivated rubber tree that it should develop a trunk 10 to 12 feet high before we allow branching. It is not practicable to tap higher on the trunk than above 8 feet and the sooner we allow the tree to branch the greater will be the growth in girth. It is after all the tapping area which is the ultimate goal in developing rubber trees for commercial purposes. We have therefore to encourage growth in the circumference of the tree.

If we were to lay down any rules as to suitable localities for the different rubber trees which can be grown in these islands we would say that in sheltered valleys with good drainage *Castilla* should be planted not higher than 500 feet above sea level. We can then plant *Hevea* on the slopes up to about 800 feet, and above this *Ceara* can be grown probably not higher than 1200 feet. If in the future *Sapium* can be demonstrated a success here this tree would probably be grown up to 2000 feet.

On account of the comparatively expensive labor in these islands it may be advisable to plant *Castilla* as above stated in suitable localities, because this tree needs less labor during the tapping than *Hevea*, which otherwise is the best producer. As for *Ceara* we are still in the dark regarding suitable methods of

tapping. It is to be hoped that this question will be settled during the experiments which are now being made in different places. In Ceylon the attention is being directed towards profitable tapping of the Ceara and a number of experiments are being made. The Bureau of Agriculture and Forestry of these Islands intends to make experiments in tapping Ceara in the small groves of this tree which were planted a number of years ago on the Island of Kauai. In Mexico similar experiments are being made on the only place where Ceara rubber has been planted in that country, the Esmeralda plantation in Chiapas. This last series of experiments is being made in connection with the La Zacualpa Botanical Station.

In summing up the points expressed above we would say that the area suitable for rubber cultivation in Hawaii is very limited; only four kinds of rubber are likely to succeed; the *Hevea* comes first, with the greatest yield of rubber, *Castilla* next, *Manihot* third, and *Sapium* is as yet untried; the limit of elevation for cultivation of these rubber trees in Hawaii ranges approximately as follows:

Castilla and *Hevea* from sea level upwards to 500 feet, the latter to 800 feet, *Manihot* up to 1200 and *Sapium*, not higher than 2000 feet. Great care is to be taken in obtaining the right varieties, and in planting under the right conditions.

POULTRY AND AGRICULTURAL EXHIBITION.

The Hawaiian Poultry Association will hold its Second Annual Exhibition of Poultry and Pigeons on Thursday, Friday and Saturday, December 20-22nd. The Farmers' Institute of Hawaii, the Board of Commissioners of Agriculture and Forestry and the Hawaii Experiment Station will also coöperate in the success of the undertaking. Besides the usual contribution of feathered stock, the bee-keepers will be represented, and there will be exhibits of silk culture, beneficial insects, fruits, flowers and ornamental trees. The exhibition will be held in the spacious skating rink on Queen street, not far from Messrs. H. Hackfeld & Co.'s building.

HORTICULTURAL INSECT ENEMIES.

BY D. L. VAN DINE.

Read by title at the Farmers' Institute of Hawaii, September 29, 1906,
accompanied by an exhibit of the injurious insects
of fruit trees in Hawaii.

As a fruit grower's aim is to produce fruit with a profit, his interest in "bugs" and "blights" is limited to the information that will enable him to prevent the destruction of such profit. The view-point is one of dollars and cents. The reason for Honolulu's door-yard trees and vines suffering as they do from their insect enemies, is not that Hawaii is especially visited by hosts of devouring pests not experienced in other countries, but rather that the pocket-book of the owners are not being hard hit. Let the raising of oranges or avocados become a man's only dependence for the bread and butter of his family and his contention for the profit with the insect enemies will become of some importance. Therefore we are not troubling ourselves to any extent over the oft-repeated statement that Hawaii *could* be a great fruit country *if* it were not for the "blights." Let the prospective fruit grower give to the problem of the insect enemies of his fruit trees, the same consideration that he must give to the selection of locality; preparation of the land; propagation and cultivation of the trees and vines; and harvesting and marketing the crop, and he will find the problem but one of many that must be solved by careful study and honest endeavor.

I could enumerate the many species of insects feeding on our fruit trees and vines and tell you their names, their peculiar characteristics and habits, their injuries and twenty other "theirs," but we do not remember details not of immediate interest to us, therefore I will try to help you to help yourselves, when the time comes when you do need the details. The supposition will not be that you have gone to the Government Nursery, received a tree for nothing, had your yard-boy put it in a place never suited for a fruit tree, and then left it there to act as a breeding place for its insect enemies, but, rather, that you contemplate raising some sort of fruit for profit and would learn its insect enemies and how to control them.

It is man's convenience that makes one insect noxious and the

other beneficial. In cultivating plants for fruit, as in all other lines of cultivation, we are trespassing certain laws of nature, and the increase of the plant feeding species of insects is one of the difficulties resulting therefrom. To off-set this disturbance, the fruit grower must be prepared to protect his trees from the ravages of insect enemies, or wage war against them if they have already gained a foothold in the orchard. To do this intelligently and with economy of time and expense, something must be known of insects in general and the insects injurious to fruits in particular.

WHAT AN INSECT IS.

The terms "insect" and "bug" are commonly applied to all minute organisms or anything that crawls; properly, an insect is a member of a certain class of lower animals, while a "bug" is a member of a certain order of insects. The term "blight" is incorrect, it being the common name of the fungus diseases of plants, themselves low parasitic forms of plant life. Insects constitute the class Hexopoda or Insecta, and the derivation of the former Greek word gives the chief distinctive characteristic of insects, that is, they possess six feet. Insects are, zoölogically, closely related to spiders, scorpions and centipedes, lower forms of invertebrate animals, but further distinguished from them by having the body segments divided into three well defined parts, and supplied with certain appendages.

STRUCTURE OF INSECTS.

The body of an insect is made of a series of segments or "body rings" divided into the head, the thorax and the abdomen. The first two divisions of the body bear certain appendages characteristic of all insects, namely the antennae or "feelers" and the mouth-parts of the head, and the legs and wings of the thorax; there being always in the adult insect three pairs of legs and usually one or two pairs of wings. The segmentation of an insect is well shown in the abdomen, not so clearly indicated in the thorax, and in the head fusion has progressed to such an extent that this part of the body appears as a box-like structure. The skeleton is external, that is, the internal organs of digestion, the nervous system and the respiratory system, as well as the muscles of the body-wall, are supported and protected by a hard shell-like covering. This covering or *chitin* is so deposited in certain places

as to form a hard and resistant surface, while in other places it is flexible enough to permit a free movement of the body as a whole or the functioning of its various parts.

Increase in size, or growth, is provided for by shedding from time to time, during the young or developmental period, this outer covering. This process is called "molting" and these changes of skin mark the early stages of development in insects.

MOUTH PARTS.

The anatomy of the head is of interest, for by the structure of the mouth-parts one can determine the nature of the injury wrought by plant-feeding species. The mouth-parts of some insects of which those of the beetles and the grasshoppers offer examples, are formed for biting off or gnawing into and masticating the portions of the plant upon which the insect feeds. That is, insects with biting mouth-parts actually chew, masticate and swallow the portions of the plant upon which they feed. The jaws of this type of insects move from side to side like swinging doors, instead of up and down as is the case in higher animals.

In such insects as leaf-hoppers, scale-insects and plant-lice, the mouth-parts are formed for sucking. The food of plant-feeding species, having a mouth after this fashion, is not portions of the plant itself, but the sap or juice thereof. The portions of the plant fed upon are left intact, but the result of the myriad of small pumps sucking out the very life of the plant can be imagined.

DIGESTION.

It might be well to refer in this very general manner to the organs of digestion of insects. They consist of the alimentary canal and its appendages. The alimentary canal is a tube running the length of the body in almost a direct line. This tube is separated into definite parts and supplied with various structures. The shape and size of the parts and the presence of certain supplementary structures depends on the food of the insect, that is, whether it is a chewing insect and takes into its system portions of the plant to be digested or is a sucking insect and feeds simply upon the sap or juice. A poison placed upon the foliage of a plant is carried with the portion eaten by a chewing insect directly into the system. On the other hand, a sucking insect would not be injured by placing a poison on the surface of its food since

its beak or proboscis extends through the epidermis to the sap beneath. Therefore in the latter case we must treat the insect itself and not its food.

INSECT CHANGES.

Just as the injurious insects of the orchard or farm can be divided into two great classes as regards their food habits, that is, chewing insects and sucking insects, so also they can be divided into two great classes or divisions as regards their process of development. All insects undergo during their developmental period remarkable changes of structure, form and habits. With some, as the moths and butterflies, the beetles and the true flies, the change of form is complete. These insects after hatching from the egg have three distinct stages of development,—the young or larval period, commonly called the caterpillar, grub or maggot; the pupa, a period of transformation; and the adult winged form. The young or larval stage is one of growth and it is during this time that the plant feeding species often do their greatest injury.

With those insects not making a complete change of form during their development, the young on hatching from the egg resemble the parent, in possessing the three distinct divisions of the body, three pairs of legs and other characteristics of the adult insect, with the exception that they are smaller in size, lack wings, and are otherwise immature.

INSECT CONTROL.

Insect control may be classified as follows: Direct Measures, Cultural Methods, Sanitation, Natural Enemies, and Quarantine.

Direct measures implies going into the orchard with the necessary apparatus and compounds and actually destroying the injurious insects in numbers sufficient to reduce their injury to a minimum.

Insecticides for biting insects (stomach poisons): Insects that bite off and swallow the portions of plants upon which they feed would likewise take into their systems any poison that might be placed upon the surface. Therefore, in combating an insect belonging to this class, that is, those actually chewing or gnawing into the foliage, the idea is to cover the surface with a poison harmless to the plant but sufficient in strength to kill the insect when taken into its stomach. The insect killing substance, or

insecticide as it is called, is applied evenly over the surface in the form of a fine spray or powder by various machines made expressly for the purpose. The arsenical poisons are the common remedy for the biting insects and among the various compounds, Paris green has been the standard one. Paris green is usually applied in milk of lime. The lime in the mixture has the property of off-setting the burning qualities of the Paris green. In low grade Paris green there is a large excess of free or water soluble arsenious oxid which will have a direct injurious effect on the foliage of the plant and give it the appearance of having been burned. The Paris green to be harmless to the plant should be practically insoluble in water. The finely divided crystals are only in suspension in the spraying mixture and for this reason, constant agitation of the liquid is necessary during the process of spraying. These crystals, though insoluble in water, are soluble in the digestive juices of the intestines of the insect and thus death is brought about by an absorption of the poison. One of the more recent arsenical poisons is seemingly better suited to the Hawaiian conditions than Paris green. This compound is an arsenate of lead. Paris green, as has been said, is quite likely to burn the foliage, especially if it is of low grade or is not used with lime; it is easily washed away by showers and being not easily seen when used alone, is difficult to apply evenly over the surface of the plant. On the other hand, the arsenate of lead is entirely insoluble in water, thus obviating any danger of burning the foliage, it is white in color, thus insuring an even coating over the plant, and is quite adhesive, not being easily washed away by showers. These properties of the arsenate of lead in the freshly prepared wet form make it preferable to the less adhesive though more active Paris green. The arsenate of lead is now on the market in paste form, ready for immediate use. Such preparations are for sale in Honolulu.

Insecticides for sucking insects (gases, contact poisons and external irritants): Since those insects feeding upon the juices and sap of plants do not swallow portions of the plant itself but gain their food by inserting the beak or proboscis through the epidermal layers into the tissues, it is to be seen that they would not be affected by a poison placed on the surface. Therefore in fighting the insects belonging to this second class, other methods must be employed. The methods are to kill the pests by applying to their bodies an external irritant or contact poison, and by submitting

them to the fumes of some deadly gas or fumigation. In the case of the external irritants applied as a spray or powder, the entire body of the insect must be covered and every infested portion of the plant treated to have the work effective. The oil sprays or washes are the most important remedy for sucking insects and the standard one has been the kerosene emulsion. The resin wash is not suited to the Hawaiian conditions because of the fact that this wash acts principally as a covering to the insect and kills by smothering the pest. Resin wash has been used with success against certain scale insects in California during the rainless season. With the frequent rains here and the necessarily greater length of time for the resin wash to act in comparison to the oil washes, the more active kerosene emulsion should be used.

It is not deemed necessary to give in this connection the various mixtures for biting and sucking insects with directions for their preparation, for the reason that the whole subject is discussed in Bulletin No. 3 of this Station, Insecticides for use in Hawaii, which has had a wide circulation in the Territory and can be received free of charge by anyone requesting same. As discoveries are made in the preparation of insecticides or the machinery for applying them of value to the residents in the Territory, the information will be published in due time for distribution. Since the character of the remedy and the apparatus for applying it depends entirely on the pest to be treated, the plant it infests and the local conditions, it is hoped the Station in instances of insect attack will be informed of the particular pest and the plant infested, and will receive specimens of both, upon receipt of which the fullest possible information will be given to the correspondent, and in so far as is possible, a personal visit of inspection made.

CULTURAL METHODS.

It is a fact accepted by economic entomologists without exception, that a healthy plant can resist to a great degree the attack of an insect enemy. To bring about maximum growth and vigor, we must see that our fruit trees receive a sufficient supply of water and plant food. Also in the various cultural practices we must consider their direct effect on the insect pests; that is, to control an insect pest by cultural methods, implies more than the practice suitable for the plant itself. For example, in tillage it may be

that as far as the plant requirements are concerned, only the surface of the soil need be kept in a friable condition, but I think it well to frequently stir the soil about fruit trees to a considerable depth to break up and disturb the queen and larval chambers of the ant nests about the roots since these insects are very active in the distribution of the scale insects. For the same reason it would be well to occasionally flood the area about the trees for a period of several hours. In pruning, furthermore, the purpose of the trees may not require leaving the center open so that a free access of light and air is possible, but just this condition is unfavorable to the development of scales and mealy-bugs, and should be practiced. Also such a method of pruning makes thorough spraying possible. Enough has been said to show that cultural methods can be made an important factor in orchard insect control.

ORCHARD SANITATION.

I have seen owners spraying for the Avocado Mealy-bug and allowing wild guava to grow about the place simply covered with the same insect. Obviously the guava should have been eradicated. If Hawaii is to become a fruit producing country, it must of necessity learn the lesson of putting on the market not alone fruit, but clean fruit. All manner of places that will harbor insect pests must be done away with. Many plants of no economic importance are included in the list of food plants of many of the insect pests. What good to fight the pests on the fruit trees and leave these plants to breed new generations? Rubbish piles must be burned, and the fallen fruit and culls destroyed. After harvesting a crop, the orchard should be as clean as it is possible to make it. This preventive work pays.

NATURAL ENEMIES AND QUARANTINE.

The first three methods of insect control, namely, direct measures, cultural methods and sanitation are of the most importance to the fruit-grower himself, since they are methods actually within his power to use at a time when his trees are menaced by injurious insects. However, there yet remains to be mentioned two more methods, that is, natural enemies and quarantine. It may be that the time will come when orchard sanitation, natural enemies and quarantine will obviate the necessity of direct

measures. Certain it is that far-reaching results have been obtained through these phases of insect warfare, but the use of direct measures on the part of the fruit-grower or planter is still a necessity, and we must await further results from the last named methods before we can do away with the former. All insect pests have, naturally, many enemies, and in some localities, notably in the United States and Hawaii, many additional ones have been introduced. With these insect friends the fruit-grower should become acquainted, and not only should their propagation and dissemination be encouraged, but the specialist engaged in the work of investigating this phase of insect control should have liberal support.

Until very recent times the development of a country agriculturally, has implied that with the introduction of desirable economic plants should come also their many and various insect enemies, and that as the commercial relations of a country became intimate with other countries such injurious species would continue to be introduced. Although many of the injurious species of insects, particularly the class that includes the scale insects, mealy-bugs, etc., are almost world wide in their distribution, there are many that are peculiar to the country in which they occur. It remains then for a community alive to its own interests to take the necessary precautions that shall prevent the introduction of these pests. Hawaii can well be commended for supporting specialists to work out the problems along these lines.

As regards the pests already present in the Islands affecting fruit trees, the grower must look in the main to his own efforts for relief. If we at the Experiment Station can help you, you must let us know your problem in all its details. After four years' experience in answering personal inquiries and letters on this subject, I feel that first of all a grower must know what an insect is, before he can form an opinion of the cause of the failure for trees to grow. We get an inquiry "The blight is killing my trees, what can I do for it?" We surmise that the "blight" is a scale-insect, but naturally wonder what the blight is, what the tree is, and are justified in many instances in thinking that the trees might die in any event. That it isn't a case of dollars and cents with many of our correspondents, we are certain, in that we fail to get specimens and further details when writing in reply. It often comes out that, "Oh well, if we must do this or that, it won't pay, I only thought you could send me a remedy that would

do it." The same person would easily understand that we couldn't send him a hoe that would cultivate without any effort on his part, the trees. A better understanding is sought. We are not an agricultural college, and cannot give a course in economic entomology, but in so far as our investigations have progressed, we are ready to give those in need the entire benefit of them.

LIST OF INJURIOUS HORTICULTURAL INSECTS IN HAWAII:

CITRUS.

(Orange, lemon, lime, grape-fruit, etc.)

The Japanese Beetle, *Adoretus umbrosus* Fab. var. *tenuimaculatus* Waterh.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

The Torpedo-Bug, *Siphanta acuta* Walker.

The Orange Aphis, (undetermined).

Scale-Insects (*Coccidae*):

The Purple Scale, *Lepidosaphes beckii* Newn.

The Florida Red-Scale, *Chrysomphalus aonidum* Linn.

The California Red-Scale, *Chrysomphalus aurantii* Mask.

Mealy-Bug, *Pseudococcus filamentosus* Ckll.

Pulvinaria psidii Mask.

The Fluted Scale, *Icerya purchasi* Mask.

Several other scale insects are recorded but are not common.

AVOCADO.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Fiorinia fioriniae Targ. (Scale-insect).

Phenacaspis eugeniae Mask. (Scale-insect).

A Bark Beetle, *Xyleborus immatulus* Blackburn.

PINEAPPLE.

The Pineapple Scale, *Diaspis bromeliae* Kerner.

The Pineapple Mealy-Bug, *Pseudococcus* sp.

MANGO.

The Mango Weevil, *Cryptorhynchus mangiferae* Fabr.

The Torpedo-Bug, *Siphanta acuta*, Walker.

Lepidopterous larva, (undetermined).

Scale Insects (*Coccidae*) :

The Mango Scale, *Coccus mangiferae* Green.

The Florida Red-Scale, *Chrysomphalus aonidum* Linn.

Phenacaspis eugeniae Mask.

Coccus longulus Dougl.

Mealy-Bug, (undetermined).

BANANA.

The Sugar-Cane Borer, *Sphenophorus obscurus* Boisd.

A Borer, *Calandra remota* Sharp.

The Cocoanut Leaf-Roller, *Orneodes blackburni* Butler.

Phenacaspis eugeniae Mask. (Scale-insect).

Chrysomphalus aonidum Linn. (Scale-insect).

Saissetia nigra Nietner. (Scale-insect).

GRAPE.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Pseudococcus filamentosus Ckll. (Mealy-bug).

The Japanese Beetle, *Adorctus umbrosus* Fabr. var. *tenuimaculatus* Waterh.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

Lepidopterous larva, (undetermined).

GUAVA.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Pulvinaria psidii Mask. (Scale-insect).

FIG.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Saissetia nigra Nietner. (Scale-insect).

HANA FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry held on October 31, 1906, the reports of the committee on forestry and of the superintendent of forestry on the proposed Hana Forest Reserve in the District of Hana, Island and County of Maui, were approved and a resolution in regard thereto adopted.

The proposed Hana Reserve embraces all the mauka portion of the Hana District. The total area is 14,825 acres. Of this 1,058 acres is fee simple land, 7,013 acres government land under lease and 6,754 acres unleased government land. The last named area can be actually set apart at once.

Following the usage of the board the resolution and reports concerning the Hana Forest Reserve are published herewith:

RESOLUTION IN REGARD TO THE PROPOSED HANA FOREST RESERVE.

Resolved, That those certain lands in the District of Hana, Island of Maui, bounded in general terms as follows:

Lying on the eastern slope of Mount Haleakala, bounded on the west and north by the Koolau District, on the east by a line following approximately the lower edge of the existing forest across the Hana District, on the south by the Kipahulu District; and containing an area of 14,825 acres, more or less, as recommended in a report of the Committee on Forestry, dated October 30, 1906, based on reports of the Superintendent of Forestry, dated March 2 and April 6, 1906, which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on maps made in March, 1906, by the Hawaiian Government Survey Department, which said maps are on file in said Survey Department and marked "Registered Maps Numbers 1268 and 1750" and "Hana Forest Reserve, Maui," and a description accompanying the same numbered C. S. F. 1690, which said description is now on file in said Survey Department, copies of which said maps and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Hana Forest Reserve."

Resolved, That the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed Hana Forest Reserve be set apart by him, subject to

vested rights therein, after the hearing required by law, as the "Hana Forest Reserve."

This resolution was adopted by the Board of Commissioners of Agriculture and Forestry on October 31, 1906.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Oct. 30, 1906.

Board of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the reports of the Superintendent of Forestry, dated March 2nd and April 4th, 1906, concerning the proposed forest reserve in the District of Hana, Island of Maui.

This proposed reserve embraces and includes the entire mauka portion of the Hana District. It contains a total area of approximately 14,825 acres. The greater part of the land included belongs to the Government, the private holdings within the reserve boundaries amounting to only about 1,058 acres. Of the government lands, about 8,100 acres are under lease; the remainder, about 6,000 acres, is open for reservation.

The object of the proposed Hana Forest Reserve is to protect the head waters of the streams on which the water supply of the Hana District depends. The Kaeleku Sugar Company, Limited, which now controls the greater part of the land within and adjacent to the reserve approves of the project and desires that the land be set apart as a reserve. Under the terms of existing leases this company is protecting the forest by keeping out cattle and taking measures to prevent fire.

Your committee recommend that the Board approve the recommendations of the Superintendent of Forestry regarding the proposed reserve and that the Board recommend to the Governor that the area be set apart by him after the usual form as the Hana Forest Reserve.

Your committee herewith submit a formal resolution carrying the foregoing recommendation into effect.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry,

March 2, 1906.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,

Honolulu, Oahu.

Gentlemen: I beg to submit the following preliminary report upon the creation of a forest reserve in the District of Hana, Island of Maui, and to recommend a boundary line therefor which should also serve as the forest line, above which the government land should not be again leased. This recommendation in no way affects the leasing of the water rights on the upper land, including rights of way for flumes and ditches and the permission to develop additional supplies by tunneling or other methods.

The present report is based upon the results of personal studies of the local conditions made on the ground in September 1904 and February 1906. It is submitted at this time in consequence of a request from the Commissioner of Public Lands for recommendations in regard to the forest line in Hana. The request was made about a year ago, following an application made to the Commissioner of Public Lands for the lease of certain tracts in the Hana District, particularly the crown lands of Wailua and Waiohinu. As Mr. Pratt desires to advertise these leases without further delay I recommend that the Board now approve the line proposed herein. Later, a final report containing a technical description of the proposed boundary line will be submitted to the Board, when the matter can be brought to the attention of the Governor in the regular way.

The area included in the proposed Hana Forest Reserve embraces all the mauka portion of the District of Hana, Island of Maui. It lies as a roughly rectangular block the makai or northeast and southeast sides of which are made by a line starting from Puu Hinai on the Hana-Koolau District boundary line and following approximately the lower edge of the existing forest across the Hana District to a point on the Hana-Kipahulu District boundary, at an approximate average elevation of 1,500 feet. The northwest and southwest sides of the rectangular are respectively the Hana-Koolau and the

Hana-Kipahulu boundary line, from the points named above to their intersection on the upper slope of Mt. Haleakala.

By far the greater part of the land within the proposed reserve belongs to the Government. A large share of the area, including all the mauka portion of the reserve, is under lease to the Kaeleku Sugar Company, much of it being covered by a single lease which runs until May 1, 1917. In this and in the other forest land leases held by the Kaeleku Sugar Company are clauses providing that the forest be protected from cattle and other sources of injury. Within but along the makai edge of the reserve are several government lands not now under lease that could at once be set apart.

The object of the Hana Forest Reserve is to protect the forest covering the watershed on the mountain slopes above Hana, from which comes the water that supplies the agricultural lands below. Practically all of the principal streams rising in the proposed reserve have been drawn upon in the past to furnish water for the purposes of domestic supply, fluming and irrigation. Just now several of the old flumes and water-heads are not in use, but if recently made plans for the development of the Hana District are carried out all the water that can be got from the mountain side could be put to good use.

The lower or makai line of the proposed Hana Forest Reserve is for a good part of the distance the mauka boundary of various private grants and awards. This line marks in almost all cases the upper limit of land suitable for agriculture under existing economic conditions.

The elevation of the highest lands in Hana on which sugar cane has been cultivated does not exceed 1,200 feet and at present the cane seldom reaches the 1,000-foot contour.

Between the line of possible cane land and the lower edge of the proposed forest reserve there is a section now covered with ferns, ti, lantana, and other vegetation of a like character, with some scattering trees. The only economic use to which this belt is at present put is the cultivation of upland taro in small patches by Hawaiians living on the lower land.

There is practically no demand in Hana for grazing land. The ranch department formerly run by the plantation has now been permanently given up and as the plantation controls for long terms the majority of both government and fee simple

land in the district, there is not enough other land available for an independent cattle ranch. The only cattle now raised in Hana are a small herd owned by a Portuguese butcher, and for the most part these animals are grazed on the lower lands that were formerly used as cane fields by the Hamoa plantation. Much of this section of the Hana District is now covered by a dense stand of lantana. Somewhat higher up guava and sumach are found in scattering clumps, which in coming years will doubtless serve as centers of distribution for these trees. If the lantana on the lower lands were cleared off there seems to be no reason why this section should not produce as much and as good sugar as formerly, if indeed the lands have not been improved by lying fallow.

For the reasons outlined above the area inclosed by the boundaries described below should, in my judgment, be created a forest reserve, and the government land within the same set apart by the Governor in as large an area as is now possible, while the reserve should be added to by the setting apart of the other government land as from time to time the leases on them expire and they become available.

Following is a popular description of the line which I recommend be adopted as the boundary of the Hana Forest Reserve and approved at this time as the forest line in the Hana District, above which government land should not be again leased. As stated above a technical description will be compiled later and submitted to the Board in a supplementary report.

Description of the Forest Line, District of Hana, Island of Maui.

Beginning at Puu Hinai on boundary line between the Districts of Hana and Koolau the line should run in a general southeasterly direction across the lands of Makapuu (gov't.), West Honomaele (fee simple), East Honomaele, Kawela and Kaeleku (all government), to a point on the shoulder of the hill called Olopawa, a few hundred feet northeast of the Government Trig Station; thence across the lands of Honokalani, Wakiu and Kawaipapa, (all government,) to a point on the pali of the Kawaipapa Gulch at the northwest corner of the fee simple land of Niumalu; thence along the boundary dividing the government land from the various grants and awards

below to the southwest corner of Oloewa (fee simple); thence across the lands of Aleamai and Haneoo (both fee simple) to the northwest corner of Mokae; thence along the mauka boundary of Mokae to its southwest corner; thence across the land of Kakio (gov't.) to a point on the northern boundary of Waiohinu (gov't., crown), where said boundary makes a marked angle; thence across Waiohinu to a point on its southern boundary somewhat further mauka where this line is marked by an angle; thence across various small fee simple lands to a point on the northeastern boundary of Muolea, where said boundary turns almost due east; thence across said Muolea (fee simple) to the northwest corner of Grant 382; thence along the mauka line of said Grant 382 to its southwest corner; thence across the land of Wailua (gov't., crown) to the northeast corner of Grant 1165; thence across the mauka boundary of Grant 1165 and the line separating the government land from other grants and awards to the Hana-Kipahulu District Boundary; thence following up said district boundary until it intersects with the Hana-Koolau District Boundary at a point on the ridge above the great Kipahulu Valley, some distance to the east of the Government Trig. Station, Wai Anapanapa; thence following down the Hana-Koolau District Boundary line to the point of beginning.

It may be noted that the line just described may be easily traced on the colored map of Maui that accompanied the report of the Governor of the Territory of Hawaii for 1901.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 6, 1906.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I beg to submit a supplementary and final report upon the proposed Hana Forest Reserve. This report contains some additional notes on the ownership and present status of the forest lands in Hana and includes the technical description of the boundary of the proposed forest reserve, prepared by Mr. F. E. Harvey of the Survey Office.

The greater part of the area included in the Hana Forest Reserve is made up by the tract known as the Hana Forest. The area of this tract as given in the last land list is 11,800 acres, of which 7,500 acres are under lease to the Kaeleku Sugar Company, Limited, until May 1, 1917. The remainder, 4,300 acres, is not now under lease.

Other forest lands within the reserve under lease to the Kaeleku Sugar Company, Limited, are the lands of Koali and Puuhaoa, Lease No. 479B, which expires December 5, 1913; a portion of Wakiu, Lease No. 518, which expires May 2, 1920; and a portion of East Honomaele, Lease No. 474, which expires August 17, 1908.

The important unleased government lands, portions of which are within the reserve, are Puualu, Paehala, Wailua, Waiohonu and Kakio, as well as some remnants which cannot now be accurately described. Wailua and Waiohonu were formerly classed as "crown lands"; all the other Territorial lands in the reserve were "government lands."

Portions of the following privately owned lands are also within the reserve boundary: West Honomaele, Aleamai, Haneoo and Muolea. These lands are all either owned or controlled by the Kaeleku Sugar Company, Limited. The approximate areas of the portions of them within the proposed forest reserve is given by the Survey Office as follows:

	Acres.
West Honomaele	187
Aleamai	357
Haneoo	84
Muolea	430
	<hr/>
	1058

There are also some remnants of fee simple land above the forest line, but their combined area is small.

The total area of the reserve is given by the Survey Office as approximately 14,825 acres. Of this about 8,100 acres is covered by Leases Nos. 492 and 579B, about 1,058 acres is fee simple land, while the remainder, 5,667 acres, more or less, is for the most part unleased government forest land. It is this portion that it is now proposed to set apart as a section of the Hana Forest Reserve.

Recommendations.

For the reasons set forth in my report on this reserve project, dated March 2, 1906, I therefore recommend that the Board approve this report and adopt a resolution favoring the creation of the Hana Forest Reserve, and that the Board request the Governor to approve the area described as the Hana Forest Reserve and to set apart such government lands within the proposed boundary as are not under lease. As nearly as can now be compiled the list of the lands which can be set apart at this time is as follows, and includes the unleased and mauka parts of the lands of Puualu, Paehala, Wailua, Waiohonu, Kākio, Wākiu and of the Hana Forest Tract and also any other remnants of government land, not under lease, within the metes and bounds of the proposed Hana Forest Reserve.

Following is the official description of the Hana Forest Reserve boundary prepared by Mr. F. E. Harvey of the Survey Office. The original description is filed in the Survey Office as C. S. F. 1690. Approximate area, 14,825 acres.

[The technical description is here omitted as it will later be published as part of the official proclamation.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ANNUAL REPORT.

Since going to press we have received a copy of the Second Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii, which covers the year ending December 31, 1905. We hope to give a review of this interesting publication in our next number. The Report has been widely circulated by mail, but should any one have failed to get it, copies may be obtained by application to the Bureau of Forestry, King Street.

*ROUTINE REPORTS OF THE DIVISION OF
FORESTRY.*

July 18, 1906.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to report my return to Honolulu on July 13th after a three months' trip to the mainland, which included visits to Washington, New York and Boston.

While in the East, and particularly while in Washington, I saw a number of persons regarding forest matters in Hawaii and made certain arrangements with officials of the Forest Service and other branches of the United States Department of Agriculture, and of the Smithsonian Institution, which will, I believe, lead to results of benefit to the Territory. I was fortunate in finding in Washington the men whom I most wished to see, especially Messrs. Pinchot, Hall and Sudworth of the Forest Service, Messrs. Galloway, Fairchild, Coville and Henshaw of the Agricultural Department and Dr. Rathbun of the Smithsonian Institution, all of whom appeared to take a real interest in Hawaiian conditions and to be ready, so far as possible, to assist in investigations leading to practical returns. I also had interviews with the Honorable J. K. Kalaiana'ole and Mr. G. C. McClellan, both of whom received me cordially.

On April 26th I delivered a paper entitled "Some Forest Problems in Hawaii," before the Society of American Foresters in Washington. Led by Mr. Pinchot, a full discussion followed which showed for one thing the deep and vital interest which he takes, not only in our forest questions, but in the conditions affecting the general welfare of the Territory as well.

In conversations Mr. Pinchot said he sincerely regretted that he was unable to visit Hawaii this summer but pressure of work made it out of the question.

ROUTINE WORK.

During the past three months the routine work of the Division has gone on as usual as you know from the reports of Mr. Haughs. The most important items have been the starting

of the Ceara rubber sample plot experiments, the preparation of several planting plans under the offer of coöperation with private owners and the distribution of Bluefield bananas.

Many samples of seed of valuable and interesting exotic trees received during the last six months are coming on well in the Nursery, while a good stock of the seed of the important local trees is now in hand.

Since Mr. Haugh's last report on the subject, the Board room has been used for meetings of the following organizations, in all nine times:

Hawaiian Entomological Society, May 3, June 7, July 5.

Farmers' Institute, May 12th.

Honolulu Improvement Advisory Board, May 29th and June 29th.

McCully Improvement Club, June 4th, July 2nd.

LIBRARY.

Among the important accessions to the Library during the past three months, outside of entomological works, are the following:

Purchased.

Grisebach: Flora of British India.

Engle and Prantl: Pflanzenfamilien.

Schimper: Plant Geography.

Bentham: Flora Hongkongiensis.

Simond: Tropical Agriculture.

Von Mueller: Report on Forest Reserves.

Roxburgh: Flora Indica.

Naturalist's Universal Directory.

Nichols: Tropical Agriculture.

De Vries: Species and Varieties.

Sorauer: Physiology of Plants.

De Candolle: Origin of Cultivated Plants.

Baker: Flora Maritius and Seychelles.

Oliver: Flora Tropical Africa.

Harvey and Sonder: Flora Capensis.

Nisbet's Forestry.

Lounsbury: Flowers and Trees.

Clement: Ecology.
 Romero: Coffee.
 Warning: Handbook of Systematic Botany.
 Ganong: The Teaching Botanist.
 Wards: Trees.
 Rundle: Classes of Flowering Plants.
 Jackson: Glossary of Botanic Terms.
 Brown: Practical Arboriculture.

Otherwise Received.

Beach: The Apples of New York.
 U. S. Geological Survey: Forest Reserve Reports 1897-1898,
 1898-1899, 1899-1900.
 New York State: Fisheries, Game and Forest Commission,
 3rd Annual Report (1897).
 U. S. Census: Supplementary Analysis, Twelfth Census.
 Index Agriculture of Massachusetts 1837-1892.

Very respectfully,

RALPH S. HOSMER,
 Superintendent of Forestry.

August 29th, 1906.

Board of Commissioners of Agriculture and Forestry,
 Honolulu, Oahu.

Gentlemen: I have the honor to submit the regular report of the Division of Forestry for the period from July 18th to date.

TRIPS TO KAUAI AND HAWAII.

My own time during this period has been occupied with the two trips to Kauai and Hawaii, respectively, and with duties in connection with proposed forest reserves and routine work of the Division.

On July 23rd Mr. C. S. Judd was appointed Special Forest Agent in the Division of Forestry, and on the 24th I went over with him to Lihue, Kauai, to start the work of making measurements in the planted forest of the Lihue Plantation.

which he is to carry on this summer. Returning to Honolulu on July 29th, I was in Honolulu for a week. Then on August 7th, I visited the Districts of South Kohala and Hamakua, on Hawaii, looking into forest problems on the Kohala Mountain, on the land of Kaohe, and in the section above the Hamakua Sugar Plantation. Many of these examinations were made in company with Mr. J. W. Pratt, Land Commissioner, and Mr. A. W. Carter, representing the interests of the Parker Ranch. I returned to Honolulu on August 18th.

FOREST PLANTING PLANS.

I am very glad to note the fact that a number of applications have recently been received for planting plans under the offer of coöperation contained in Circular No. 1 of this Division. From August 14th to 25th Mr. Haughs was on the Island of Maui, in response to requests from the Wailuku Sugar Company, Dr. J. H. Raymond and Mr. W. J. Coelho of the Wailuku Improvement Association. For the details of this trip Mr. Haugh's own report should be consulted.

On Oahu similar applications have been received from the Waianae Plantation Company, and from Mr. H. M. von Holt, representing the Oahu Railway and Land Company, while a meeting of gentlemen representing the plantation interests in the Ewa Basin has been called to discuss planting projects in that district.

COLLECTION OF SEED.

Mr. Haugh's report shows that considerable quantities of seed have been collected within the last few weeks. The Division is also in receipt of several shipments of foreign seed, notably several packages of pine seed from the United States Forest Service. These seed will be distributed to gentlemen who are coöperating with the Division in experimental planting.

RUBBER EXPERIMENTS.

A considerable quantity of Ceara rubber seed has been sent out to various persons throughout the Territory who have agreed to plant the seed and occasionally report upon it to this Division. Recently the offer to distribute sample lots of Ceara

seed has been made to the general public, so that many more packages will probably be sent out within the next week or two.

CEARA RUBBER GROVE ON KAUAI.

In this connection mention may be made of a grove of 104 living Ceara trees, about 6 years old, which Mr. Judd has found in the planted forest of the Lihue Plantation on Kauai. Provisional arrangements have been made with the Lihue Plantation Company, looking toward experiments in systematic tapping of these trees. The details of this matter will be reported upon later. For further details in regard to this grove reference should be made to the very comprehensive report prepared by Mr. Judd, under the date of August 24th.

FOREST FIRES.

I have to report two brush fires in Nuuanu Valley, respectively on July 24th and August 16th. The first fire was on the slope below Pacific Heights; the other on the ridge above the property of the Country Club. For further details in regard to these fires reports by Mr. Haughs and by myself should be consulted.

MEETINGS.

The Library room in the Board building was used on August 2nd for the 19th regular meeting of the Hawaiian Entomological Society, on August 13th by the Pawaa Improvement Club, and on the 6th, 14th and 24th by the Hawaiian Poultry Association. At the meeting of the 6th, an address on the "Raising of Fowls" was given by Mr. B. M. Stone of Fresno, California. The meeting of the 14th was the regular monthly meeting of the Society, and that of August 24th was an executive committee meeting. In return for the privilege of using this room, the Poultry Association is to subscribe to a number of Poultry Journals which will be turned over to the Library of this Board, where they may be consulted by any one interested.

DISTRIBUTION OF YEAR-BOOKS.

During the past few weeks the quota of the Year-book of the Department of Agriculture for 1905 received from the Delegate

to Congress has been distributed from this office to persons in one way or another connected with the Board and to those applying under an offer in the newspapers. On the opening of the schools in September each principal will be furnished with one copy of the year-book. A few still remain for general distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

October 3, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the regular report of the Division of Forestry for the period from August 29th to date.

TRIP TO KAUAI.

My own time during a considerable portion of this period has been occupied with a trip to the Island of Kauai. Leaving Honolulu on September 4th, I spent three days at Lihue, going over with Mr. C. S. Judd, the figures which he had been collecting during the preceding month, and discussing with him plans for the completion of the field work and the preparation of the report resulting from his investigation. During this time I also visited the two Ceara rubber groves in the planted forest at Lihue and in the Kaluahonu Gulch at Koloa, and made further arrangements with the Lihue and Koloa Plantation Companies, looking toward the experiments in systematic tapping of these trees, which are soon to be undertaken under the auspices of this Board and the Hawaii Experiment Station.

From September 8th to 20th I was engaged in making an examination of the mauka portion of the Kona and Waimea Districts of Kauai, visiting in turn Mr. Walter D. McBryde, Mr. Francis Gay and Messrs. Augustus and Eric Knudsen. Thanks to the courtesy of Messrs. Gay and the Knudsens I was able to see much of the upper portion of Waimea. As a result of this examination I shall, in the near future, submit a

report recommending a forest reserve boundary, extending from the present private reserve of the Lihue Plantation Company at Kilohana Crater back of Lihue around to and including the Napali District. On Thursday, September 20th, in company with Mr. S. Weinzheimer, I went over the proposed forest reserve boundary on the mauka portion of that plantation, as I had earlier in the month visited with the Rev. J. M. Lydgate, the proposed forest line across Mr. G. N. Wilcox's land of Haiku.

From September 21st to 24th inclusive, I was engaged with a trip to Hanalei in company with Messrs. W. E. Rowell and Fred E. Harvey of the Survey Office. The object of this trip was to examine certain land within the boundaries of the Halelea forest reserve on which Mr. Rowell had expressed a desire to grow rubber. This matter will form a subject of a report to the Committee on Forestry in the near future. On September 25th I returned to Honolulu where I have since been engaged with the preparation of reports and attention to routine matters of the Division of Forestry.

REPORTS OF THE FOREST NURSERYMAN.

Special attention is called to Mr. Haugh's reports under the dates of September 4th and October 2nd, in which are noted various points of interest that have occurred during September in connection with his section of this Division. During this period planting plans have been prepared by him for the Wailuku Plantation, for Dr. J. H. Raymond, and for the Wai-anae Plantation. Mr. Haugh's reports contain an interesting note in regard to the work done by the Wailuku Improvement Association, in which the Hon. W. J. Coelho has taken a very active part.

TRIP OF THE FOREST NURSERYMAN TO HAWAII.

In response to requests for planting plans Mr. Haugh left yesterday for a ten days' trip to Hawaii to visit the Kukaiau and Pahala Plantations, and to inspect some other planting work started earlier in the season under the supervision of the Division of Forestry.

ROUTINE WORK.

During September the routine work of the Division has gone on as usual. In connection with the seed collection it may be noted that a number of packages of seed of native Hawaiian plants have been prepared and sent to botanical gardens and other institutions in various parts of the world. By such an exchange we expect to receive in due course important additions to our own collections.

LIBRARY.

Owing to the fact that several pamphlets have been removed from the Library by unknown persons it has become necessary to adopt somewhat stricter rules governing the reading room. Each visitor is now obliged to register upon entering the Library, while careful track is kept by one of the members of the staff of the several publications which he consults. I regret that even this action has become necessary for I desire that the Library shall be freely used by all those interested in the general subject of agriculture.

MEETINGS.

The Board room was used during September for the following meetings:

Hawaiian Entomological Society, September 6th.

Hawaiian Poultry Association, September 11th, 19th and 26th.

The Waialae, Kaimuki and Palolo Improvement Club (annual meeting), September 28th.

Honolulu Improvement Advisory Board, also on September 28th.

Farmers' Institute, September 29th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

October 31, 1906.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the routine report of the Division of Forestry for the period from October 3rd to date.

During the first portion of this period I was in Honolulu, engaged with the preparation of reports upon the land of Kahohe, Hawaii, and a modification of the Halelea (Kauai) Forest Reserve boundary, and routine matters of the Division. The two reports were submitted to the Committee on Forestry on October 15th.

On October 16th, in response to a request from the Hawaiian Mahogany Lumber Company, Limited, I went over to Hilo on the Kinau and spent the next week with Mr. E. H. Cant, the manager of the company, going over with him in detail, on the ground, his plans for logging the mature Koa on the Bishop Estate land of Keauhou, Hawaii. I returned by the Mauna Loa, arriving in Honolulu on the 26th.

Mr. Haugh's time during the greater part of October has been occupied in supervising the shipment of plants, sent to various schools throughout the Territory for use on Arbor Day, November 2nd, and in preparing planting plans and reports upon the tracts in Hamakua and Kau examined by him during his recent trip to Hawaii.

ROUTINE WORK.

On October 11th, Miss Marie Legros was appointed for a temporary period as assistant clerk to undertake certain routine office work under the Board, consisting of the re-arrangement of the mailing list, the classification of the card catalogue of United States Experiment Station publications and certain other work in connection with the Library.

The second annual report of the Board for the calendar year 1905 appeared on Saturday, October 13th, when a few advance copies were received from the printer. This report will be generally distributed within the next few days when mailing envelopes are received.

FOREST FIRES.

As a result of the action taken by the Board at a meeting held on October 3rd, I have been informed by the secretary of the Country Club that the expenses of the men ordered out for fire fighting on the Country Club property will be borne by that organization.

MEETINGS.

During the month the Library room of the Board has been used by the following organizations:

Hawaiian Entomological Society, Oct. 4th.

Hawaiian Poultry Association, Oct. 3rd and 9th.

Honolulu Improvement Advisory Board, Oct. 15th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

*THE POLICY OF THE BOARD IN REGARD TO
LUMBERING.*

The interest now being taken in the koa lumber industry on the Island of Hawaii, where two companies have begun work in the woods, makes important the attitude of the Board of Agriculture and Forestry in regard to this phase of the forest question. In the following reports read and approved at the meeting of the Board held on Oct. 3, 1906, may be found an expression of the Board's policy in this matter, with an outline of the restrictions which will be placed on logging in any work with which the Board has to do.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Oct. 3, 1906.

Board of Agriculture and Forestry,
City.

Gentlemen:

Your Committee on Forestry have considered the report of the Superintendent of Forestry, R. S. Hosmer, of even date here-

with, relative to the request of the Hawaiian Mahogany Lumber Company, Limited, to report on the proposition to lumber certain portions of the districts of Kona and Hilo, and hereby report that they approve of the recommendations of the Forester in said report contained and recommend that a copy of the said report be furnished to the said Hawaiian Mahogany Lumber Company, Limited, as a reply of this Board to their communication dated August 6th last.

Respectfully submitted,

L. A. THURSTON,
W. M. GIFFARD, L
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Oct. 3, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen:

At the meeting of the Board held on August 8th, the following letter was referred to me for consideration and report:

Honolulu, August 6th, 1906.

Bureau of Agriculture and Forestry,
Honolulu.

Gentlemen:

We are desirous of obtaining an expert opinion as to what koa in the Kona and Hilo districts, embodying land belonging to the following parties: John Maguire, Mrs. E. Greenwell, Buchholtz Estate (controlled by H. Hackfeld & Co.), John D. Paris, Colonel Norris, Mrs. Richardson, Dr. Hutchinson, and the Wilsons, together with Government land, could be lumbered without danger of injury to the forests or the water supply in that district. As Mr. Hosmer is the only authority on forestry in this Territory, we desire, if possible, to obtain his services in this matter.

We understand that he has work ahead which will occupy his time for about six weeks. We desire, if possible, that he be authorized by your Board to undertake the above work for us at the end of that period, or as soon thereafter as possible.

Thanking you in advance for an early reply, we remain,

Very truly yours,

HAWAIIAN MAHOGANY LUMBER CO., LTD.

R. W. Shingle,
Secretary.

The object of the company in making the above request is that they may use the report as an aid in securing options on the koa on the lands in question against the time when it is found possible to undertake systematic lumbering.

To furnish adequately the information requested entails a careful examination of each of the tracts enumerated, a matter necessitating field work extending over a number of weeks. In discussing with the Committee on Forestry a few days since the advisability of making such an examination it appeared that in view of the present status of the koa industry in the Territory, a general statement might for the present be sufficient, leaving until nearer the time of actual work the detailed examination of each of the several tracts. I have accordingly prepared this report, which I submit with the recommendation that a copy be transmitted to the Hawaiian Mahogany Lumber Company, Limited.

The general policy of the Board, as well as my own attitude in the matter, is in favor of lumbering the mature trees of merchantable value in the Hawaiian forests, wherever such work can be done without detriment to the continued well being of the forest as a whole. In certain districts where the primary value of the forest is from its serving as a protection cover on important watersheds it will probably be found advisable to maintain the forest intact.

But in districts where, except in restricted localities, the question of stream protection is a minor consideration, as is the case in the greater part of Kona and much of Kau, there is in my

judgment no good reason why the forest, while being permanently maintained, should not be so managed as to serve as a continued source of timber and other forest products. This indeed is the essential object of forestry—the perpetuation of the forest through wise use.

From my acquaintance with Kona and Kau I believe that because of its general relation to the various industries of these districts and to some extent on account of the influence which the forest may exert on the local climate it is to the advantage of the Territory that most of the area in these districts, now covered by the koa belt be kept permanently in forest. For this reason I recommend that when lumbering is undertaken, either on government or private lands, the work be done in accordance with the methods of practical forestry.

By the adoption and carrying out of a few simple rules the future welfare of the forest will be assured and these can be put into effect without working any appreciable hardship on the contractor. The regulations which it may be advisable to adopt may differ slightly for various tracts and can only be stated exactly after a detailed examination of the given area has been made on the ground. As has been stated above such examinations can be made later when the time for actual work is nearer at hand.

In general the regulations to be recommended will follow the outline given below. Unless such regulations are made a part of the contract I cannot recommend that lumbering be undertaken in Kona or Kau.

The main points to be observed in drawing up a lumbering contract are:

(1) *The protection of the forest from fire during and immediately after the logging operations.* The importance of this matter is so self evident that it hardly needs to be emphasized. The contractor should be required to exercise all reasonable care in the use of fire, and should a forest fire start on the tract from any cause during the term of his contract he should be obliged to turn out his men to fight it.

(2) *The protection of the area from cattle after lumbering to secure reproduction.* The central idea of forest management being the perpetuation of the forest it is essential that steps be

taken to secure the replacement of the trees removed by logging. In most cases a new stand of koa can be secured through natural reproduction. The opening up of the forest that forms a necessary part of the logging of the mature trees insures in most cases excellent conditions for koa reproduction. But as cattle are particularly fond of the young koa it is essential that they be excluded from the tract after lumbering, at any rate, until the trees grow large enough to protect themselves. As the benefits arising from this provision revert wholly to the owner of the land it seems to me that if the contractor is required to build the fence he should receive a consideration for the work. But that the fence be built I regard as an essential feature of the forest regulations.

(3) *A restriction as to the size of the trees cut.* The idea of utilization under forestry methods is to take out the mature trees only, leaving the younger ones to make up subsequent crops. On the Keauhou tract the minimum diameter at which koa trees should be cut, was fixed at 24 inches, diameter breast high ($4\frac{1}{2}$ feet above the ground). Possibly in Kona a smaller minimum diameter, say down to 18 inches, might be used. This cannot be fixed off hand, but as the present condition of the koa industry hardly justifies the logging at a profit of the smaller trees there should be little trouble in arriving at a diameter limit mutually satisfactory to the contractor and to the forester.

(4) *Prevention of Waste.* So far as possible all merchantable material should be removed from the forest and turned to account. This includes as complete utilization of the felled tree as may be and the application of approved methods and machinery to the various branches of the work. Just how closely the work can be done depends on the local conditions that govern the cost of logging, but the contractor should be required to do his work in a systematic and careful way. As it is as much to his advantage as to that of the owner of the land to do so there should be no trouble on this score.

(5) *Protection of small trees during lumbering and removal of tops.* The exercise of reasonable care should be required in the logging that small trees, fern and other undergrowth, be not necessarily damaged and that other avoidable injury to the forest

be prevented. The question of the removal of the tops depends largely upon how much of the tree can be got out and sold. Where a large top must be left in the woods it is advisable, in order to lessen the danger from fire and to get rid of the slash obstructing the young growth, that it be so cut that all the main limbs be brought in contact with the ground. Just how far it is feasible to enforce such a regulation, without working hardship on the contractor can only be told after an examination of each tract.

With regard to the Hilo District my feeling is that except for the koa on the Kaumana and Ponahawai lots back of Hilo town—which I see no objection to lumbering under an arrangement generally similar to that recommended for Kona—lumbering operations should not be undertaken until a careful study of the district with this special object in view, has been made. There are doubtless certain places which could be logged under proper restrictions without detriment to the general welfare of the district, but in other situations, such for instance as the portion of Piihonua, from which comes the water supply of Hilo town, the forest should only be opened up, if at all, after a careful study has been made on the ground.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

PRESS BULLETIN ON FOREST PLANTING.

The Division of Forestry of the Board of Agriculture and Forestry has recently issued as Press Bulletin No. 4, a four page leaflet by Mr. David Haughs, Forest Nurseryman, entitled "Instructions for Propagating and Planting Forest Trees."

The text is as follows:

INTRODUCTION.

This press bulletin has been prepared to answer inquiries that are continually being made to the Division of Forestry regarding the best methods to use in tree planting in this Territory. The directions here given are the result of many years experience on the several islands of the group and will, it is believed, meet most of the more common difficulties.

Those desiring further information on any of the points here mentioned, or on other matters having to do with tree planting should not hesitate to call upon the Division of Forestry. It is one of the functions of this office to give advice and assistance to all residents of the Territory desiring this kind of information. Letters of inquiry should be addressed to Mr. David Haughs, Forest Nurseryman, Box 331, Honolulu, Oahu.

*PROPAGATION.**Seed Boxes.*

Shallow boxes from 3 to 4 inches deep and from 12 to 14 inches by 18 to 20 inches are the sizes generally used.

Empty boxes can usually be bought cheaply from grocery or liquor stores and cut into the sizes required.

Drainage.

Five or six $\frac{3}{4}$ -inch holes should be bored in each box for drainage.

Kind of Soil to Use.

Good light soil well mixed with a liberal allowance of sharp sand and put through a fine sieve is the best to use for seed raising. Some experience however is essential to the best results in preparing it. It should be of such character that when a damp portion is firmly compressed in the hand it will fall apart when released. It should never bake. Good old garden loam

to which an equal quantity of sand has been added is usually a good soil for propagating seed. The soil should be sifted and thoroughly fined before the seeds are put into it, especially when small seeds are to be sown. The sieve used should be as fine as mosquito netting.

Filling the Boxes.

The boxes should be filled to within half an inch of the top, and the soil smoothed over with a small piece of board.

Sowing the Seed.

The seed should be sown evenly over the surface and pressed lightly with a smooth piece of wood to imbed it in the soil.

Proper Depth for Sowing.

The proper depth for sowing varies according to the size of the seed. Seed such as the different species of Eucalyptus, Casuarina, etc., should be sown upon the surface and then covered with a very thin layer of finely sifted soil or sand. If free loam cannot be obtained use fine sand mixed with about one-fourth soil.

From one-sixteenth to one-eighth of an inch of covering for seed such as the ones mentioned will give the best results. A very good rule to go by in regard to seed sowing is to make the thickness of the covering equal as nearly as possible the diameter of the seed.

Attention to the Soil after Sowing.

After sowing, the soil should be kept moist but not too wet. If too much water is used damping off is very apt to set in and this fungus disease often proves very disastrous to such seedlings as the different species of Eucalyptus, Casuarina, Grevillea, Acacia, etc. A fine sprinkler should be used when watering.

Transplanting.

When the plants have grown to from 2 to 3 inches high they should be transplanted into other boxes and the plants set in lines from 2 to 3 inches apart according to the species, some requiring more room than others. Thus the different species of the Ironwoods (*Casuarina*) and most of the Eucalypts should be planted about two inches apart, while the Black Wattle (*Acacia decurrens*), the Silver Wattle (*Acacia dealbata*) as well

Practical Information for Beginners in Irrigation. By S. Fortier, Irrigation Engineer. Pp. 40, figs. 25. (Farmers' Bulletin No. 263.)

This Bulletin discusses the preparation of land for irrigation, the construction and location of farm ditches, methods of irrigation for several crops, and the management and economy of the water supply.

The Brown-tail Moth and How to Control It. By L. O. Howard, Entomologist. Pp. 24, figs. 10. (Farmers' Bulletin No. 264.)

Description, life history, and habits of the Brown-tail moth (*Euproctis chrysorrhæa*), with suggestions for its control. The Bulletin also contains a summary of the Massachusetts law for the suppression of the gipsy and brown-tail moths.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

- Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.
"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

- "The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 63 pp.; 3 plates; 10 text figures.

DIVISION OF FORESTRY.

- * "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.
"Instructions for Propagation and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

DIVISION OF ANIMAL INDUSTRY.

- "Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

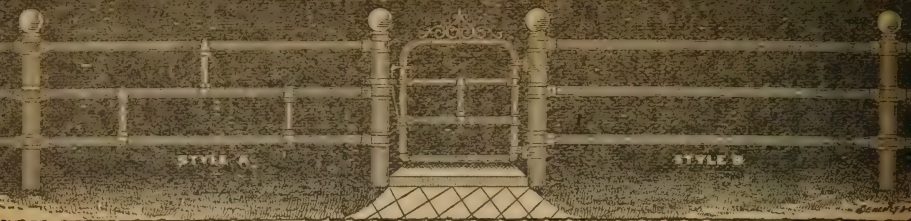
DIVISION OF AGRICULTURE.

- Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

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DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly, ISRAEL W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. III.

DECEMBER, 1906

No. 12

The sisal fiber produced by the local plantation continues to be of excellent quality and to compare favorably with that grown elsewhere. The Portland Cordage Company recently was the consignee of a ton of Hawaiian sisal to manufacture into rope. Hitherto almost the entire output of sisal from the islands has been received by the Tubbs Cordage Company of San Francisco. An exhibit of Hawaiian fiber at the recent Minneapolis State Fair was very favorably commented upon by the local judges.

It is to be hoped that the experiment by Mr. H. Roberts in sun-dried mangoes will lead to sufficient interest in the subject to induce other growers to make a similar attempt. The dried fruit, as shown at the last Farmers' Institute meeting, met with very general favor, and many well known fruit growers present expressed their opinion that the product could be marketed on the coast. During next mango season, the best method of curing the fruit should be determined, and owners of mango trees could not do better than write in the meantime to mainland agents to arrange an experimental shipment. In this case, as it is always in initial ventures, it is imperative that our first consignments should also be the best of which we are capable in order to attract favorable criticism, and due attention should be paid to such qualities as cleanliness and appearance. With our prolific mango crop and the ready help to be obtained from the youths of Honolulu, there is no reason why the sun drying of mangoes should not be profitable.

The introduction of harvesting machinery into the Hawaiian rice fields, if at all commensurate with the benefit derived from former similar experiments in other countries, is one which is probable in time to entirely change the aspect of the conditions of this industry and to remove it from an old historic and picturesque survival into the position of being able to take advantage of the latest achievement of modern science.

Another event which is likely to be attended with far greater and wider results is the experiment lately conducted to harvest the unwieldy cane with modern machinery. Should this attempt be as successful as it appears to have been, it will materially assist to ameliorate the most pressing demands of the labor problem of Hawaii and will tend to the reduction of the production cost of sugar, which will be beneficial to cane-sugar countries in their competition with beet growers. It is estimated that the cane harvester achieves the work of sixteen men, while the rice machine takes the place of nearly twice as many more. If this allowance is not too liberal the harvesting of the rice and sugar crops by machinery will wholly alter the economical aspect of this branch of two of our chief industries.

Much attention is now being directed in Honolulu to the recently introduced "fruit" called the rosella or roselle. Strictly speaking this is not a fruit at all, but consists of the fleshy calyx of a cultivated hibiscus. The calyx in this instance ripens and becomes red and juicy, and possesses all the characteristics of an ordinary fruit. The chief use of the roselle is for making jams and jellies, and for this purpose it somewhat resembles, and by some is considered superior to cranberry. In preparing the roselle for cooking the scarlet calyxes only are used, the central seed pods being rejected. During the past years the Experiment Station has distributed much roselle seed and the plants therefrom have very generally been successfully raised. The cultivation of the roselle is simple and its introduction here will afford a supply of "soft fruit" of a kind which Hawaii has hitherto been deficient. The instance of the calyx of a flower developing the attributes of a fruit, at the expense of the true seed vessel is unusual, but is no more extraordinary than that found in the cashew nut. In this instance the stalk of the fruit thickens and is eaten, while the fruit itself possesses no food value. The Forester has just received an illustrated article on the cultivation of this interesting fruit, which will appear in January. It is written by Mr. Higgins of the Hawaii Experiment Station.

The use of charcoal in vegetable growth has been investigated in the Botanical Gardens at Washington. The chief value of charcoal lies in the fact that by gradual decomposition

it yields carbonic gas and thus directly furnishes one of the most important elements of plant food. It is found that in pot plants a mixture of two-thirds fir or pine charcoal and one-third of vegetable mold has a marked stimulus on growth, and results in healthy stems and foliage and a greater profusion of blossoms. Plants in pots containing much charcoal require more regular watering than others, as the charcoal allows the water to percolate freely, and admits air, which drives the soil rapidly. The use of a little charcoal in water has a wonderful effect in preserving the life of cut flowers. In this instance the benefit of the charcoal is probably chiefly due to its preservative effect and its capability of allowing the water to remain clear and odorless.

The success of the Wahiawa pineapple growers is now assured, and once more it is determined that Hawaiian products rank second to none in the open market. It is invidious, however, to assume that the Wahiawa fruit is the best in the islands. Equally fine pines are grown on the other islands, those from Haiku and Kona being probably the best known. In fact when such a high standard of excellence is attained as has been achieved with Hawaiian pineapples, such differences of flavor, aroma, color and texture are due largely to individual taste and to particular varietal qualities, rather than to the inherent merits of special localities.

The straw hat industry in Curaçoa is proving remunerative under the assistance of the local government and the Society for the Promotion of Agriculture. Skilful hat weavers have been engaged to instruct the people in the manufacture of fine hats. The sale of hats is effected through the society mentioned above, and the prices obtained in the American and European market have ranged from about one to two dollars each. The hats are made from an imported straw and somewhat resemble "panamas." The export of hats from Curaçoa in 1904 amounted to 46,593 dozen of a total value of over sixty thousand dollars. The hat industry is one that would well repay the investment of capital in Hawaii. With our many beautiful local materials, and the deft fingers of the natives who are proverbially good hat weavers, there is no reason why Hawaiian made hats should not find a ready sale on the coast

and be instrumental in inculcating habits of business and frugality among a class of people whose position is gradually becoming one of more and more dependence on the community.

The activity in opening up new land for home building in Manoa Valley is instrumental in attracting attention to the desirability of building another outlet from the valley in the direction of Moiliili. Kalihi valley has lately been made somewhat more accessible by additional road construction, and a loop roadway is well on toward completion in Pawaa. The opening of these roads will do much to add to the attractive drives around Honolulu and will assist in distributing the heavy loads of bananas and taro from the valleys, which at present are confined to only one or two outlets.

Enquiries have recently been received from the mainland for the shipment of Hawaiian peanuts. The cultivation of the peanut is simple, and possibly worth attention, although in view of the large area already in cultivation in other countries, there appear to be many crops equally suitable to the islands and of a more promising nature, which merit first attention.

We publish this month, in response to a request of the Superintendent of Forestry, a somewhat lengthy and technical document relative to the recent important land transactions on Maui. Although not interesting to the general reader, it is important as a matter of record and as affording an index to future similar cöoperative transactions.

In a recent letter in the Pacific Advertiser Mr. W. Hannestad advocates large appropriations for forest planting and urges that all moneys spent on forestry are amply repaid in the future benefits which accrue. Mr. Hannestad is now stationed at Kailili, Maui, and was formerly engaged in forestry in Norway for eleven years.

The McBryde Sugar Plantation is reported to be encouraging the growing of pineapples on Kauai and to be contemplating

ing the establishment of a pineapple cannery there. It is thought that the new industry will help to make the condition of local labor market more constant.

This number of our paper completes Volume III, and we take the opportunity to thank those of our contributors who have assisted us so generously throughout the year. Mr. Ralph Hosmer has again placed the Forester under an obligation, by his continued interest in its welfare, throughout the year. The officers of the Hawaii Experiment Station, the Bureau of Forestry, the Hawaiian Sugar Planters' Association, together with many writers in the islands and on the mainland, have also done much to render the publication of practical utility. Mr. Jacob Kotinsky has for the latter part of the year contributed a regular series of valuable entomological papers and together Mr. Alexander Craw kept our readers informed of the interesting work of his department.

Owing to the inclusion in this number of a quantity of official matter the account of the recent Poultry and Agricultural Exhibit will not appear until next month.

A title page, index and table of contents to Volume III will be issued with the January number.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Second Annual Report.

The second annual report of the Board of Agriculture and Forestry has recently been published, and furnishes in an interesting and comprehensive manner an account of the work of the Board during the year 1905. The publication commences with a record of the new legislation enacted relating to forestry matters and also with the regulations adopted by the Board to facilitate the administration of its work.

During the year eight different publications have been issued by the Board, three by the Division of Forestry, two by

the Division of Entomology and three by the Division of Animal Industry.

The Division of Forestry has remained, during the period treated, under the supervision of Mr. Ralph S. Hosmer, as superintendent, with the coöperation of Mr. David Haughs as assistant and nurseryman. The district foresters have, with few exceptions, remained the same as those of former years. During the year three important forest reserves have been established, aggregating 190,469 acres. Much work has also been accomplished in preparing to create other reservations, which will be set apart at an early date. Next to the establishment of forest reserve the reforestation of already denuded areas is a matter of the utmost necessity, but the lack of funds has precluded any attention being devoted to this subject. It is satisfactory to know, however, that under the supervision and advice of the division many individuals and corporations are doing good work in forest planting. The erroneous opinion prevails with many that a forest reserve means the locking up from economic use of a certain forest area. This is a mistake. Conservation of water is one of the principle objects in view. With this is often associated the careful removal of old lumber which allows the growth of young trees and enhances the value of the forest, provided cattle is excluded. The action of the Bishop Estate in asking advice of the Board respecting the proposed lumbering of koa on Hawaii, and the suggestion given by the Board as to the best methods of proceeding with this work in order to safeguard the potential future output of koa lumber, is eloquent testimony that a beneficent forest policy is one looking to the best productive capacity of a reserve.

The Board has assisted materially in the way of individual enterprise by its wise policy of gathering the seeds of beneficial trees and distributing them at cost. The rapidly developing interest in the production of rubber has also received recognition and imported *Castilloa* trees have been set out in Moanalua valley, where they are doing well. From these, seeds will as soon as available be distributed. The importance of fresh rubber seeds is apparent when of 4,000 imported from Mexico by Mr. George R. Ewart only one or two have germinated.

The Division of Entomology also retains its former per-

sonel, Mr. Alexander Craw being superintendent and inspector; Mr. A. Koebele, consulting entomologist; Mr. J. Kotinsky, assistant entomologist, and Mr. C. J. Austin, inspector's assistant. The quarantine regulations against the introduction of dangerous insect pests have been efficiently enforced during the year. It is desirable, however, that a vegetable pathologist be appointed to undertake the exclusion of fungus diseases, many of which have already found their way to the islands. The attention of the inspectors has been largely occupied in enforcing quarantine regulations against fruit from countries infested with fruit flies, the harmful attacks of which have, as is well known, practically rendered the production of musk melons impossible in Hawaii. Insect pests are not the only object of the inspector's solicitude, as is evidenced by a collection of fourteen snakes which adorn the Board's museum. The importation of plants and seeds by mail has also been closely scrutinized. Another most important phase of the entomological division work is the collection, propagation and distribution of beneficial insect parasites. Much excellent progress is reported in this direction.

The Division of Animal Industry was only created recently, in obedience to an enactment of April 26, 1905. Dr. Norgaard is in charge of this important work and has already accomplished much during his brief tenure of office. During his preliminary inspection of the island stock he has found the condition of affairs to be one requiring close attention. Regulations have been passed by the Board, in accordance with Dr. Norgaard's advice respecting the inspection of imported stock and other matters. Circulars have also been distributed descriptive of farcy and glanders, which latter disease has been found in more than one locality. An animal quarantine station has been established at Kalihi in consequence of this condition.

Of 100,000 sheep in the Territory, during the past year the veterinarian has personally superintended 40,000 dippings.

The Division of Agriculture, in connection with the Board, is efficiently carried on by the Federal Experiment Station. The most important work of the station has been in connection with the raising of tobacco. Great success has attended these efforts which are calculated to exercise a wide influence in the agricultural future of the islands.

Following the general epitome of the year's work, as outlined above, are the specific reports of the various officials. Mr. Hosmer's report comprises seventy pages and contains a detailed account of the year's work of the Division of Forestry. The part devoted to the practical development of the economic resources of the Hawaiian forests is of particular interest, and affords the chief index to the concrete results achieved by the division. Among the commercial enterprises enumerated and described may be mentioned the formation of the koa lumbering company to exploit the forests of Keauhou; the action of a Hilo firm in undertaking the systematic manufacture of telephone insulator pins from ohia lehua, which promises to develop into an important industry; the experiments arranged between this division and the Oahu Railway & Land Company to determine the value of ironwood railroad ties; and the experimental shipment of black wattle tan bark, as already described in a press bulletin of the Hawaii Experiment Station. Among the plans for the coming year are included the completion of the arrangements to set aside the forest reserves now pending; the establishment of a proper system of forest administration, and a continuance of the practical assistance to private tree planters as outlined in a former division publication.

Mr. David Haughs submits an account of the work which has fallen to his share during the year. This has chiefly centered around the collection and distribution of seed throughout the islands, the propagation and distribution of plants, experiments with the cultivation of rubber trees and the furnishing of advice and assistance to amateur foresters.

Brief reports then follow from various District Foresters throughout the islands, elicited in response to a circular letter from Mr. Hosmer, requesting data of importance to forestry conditions. A perusal of the replies received, affords much interesting reading as to local conditions.

The report of the librarian concludes the matter devoted to the Forestry Division.

Mr. Alexander Craw, of the Division of Entomology, then presents a synopsis of the agricultural-horticultural quarantine work performed during the period in question. The value and importance of this work can only be appreciated from a knowledge of the former experience of the islands, as it is a well conceded fact that all the insect and fungoid pests which ravage

our crops have been introduced upon plants from other countries. The loss to Hawaii in one sugar crop, two years ago, from the depredation of one imported pest alone was upwards of three million of dollars. It is safe to say that had the rigorous quarantine inspection been in operation soon enough that this enormous loss would not be now recorded. The division is now engaged upon the destruction of this insect. Among the destructive pests excluded during the past year are enemies of the sugar-cane, coconut, orange trees and many other plants.

Mr. Jacob Kotinsky's work during the year has been principally occupied in the breeding and distribution of beneficial insects; breeding and study of injurious insects and their enemies; identification of insects brought or sent to the office; classification and arrangement of collections; selection and purchase of books and supplies; the usual routine of correspondence attendant upon the above, and attention to visitors. Two circulars were written and published during the year, and, beginning with September, a popular monthly contribution on timely entomological topics was made to the Hawaiian Forester and Agriculturist. Two inter-island trips were made during the year and many official visits paid in and about Honolulu and other portions of Oahu.

A determined effort has been made to investigate the lantana insects—a work which is not yet complete. Preliminary notes are given in the report of these beneficial parasites, together with excellent illustrations, and general information of their habits. This portion of Mr. Kotinsky's work is particularly instructive and a perusal of it, by those interested in the encroachment of lantana, is to be commended. Much interesting data is also furnished by the writer on the horn flies, inoculation of the Japanese beetle, coffee diseases, and other important matters.

The report of Mr. Victor A. Norgaard, chief of the Division of Animal Industry, being the first report of the Territorial veterinarian, then follows. After a general introduction it devotes itself to the following subjects, in order: The Mallein Test for Glanders; the Prevalence of Glanders; Watering Troughs and Hitching Posts; Tuberculin Test for Tuberculosis; Scabies in Sheep; the Horn Fly Spreads Scabies; Pro-

losis; Scabies in Sheep; the Horn Fly and Scabies; Protection from Texas Fever; Big Head Among Horses; Cancer Among Cattle; Liver Fluke in Cattle; Encouragement of Hog Raising, and the Poultry Industry.

According to Dr. Norgaard, the Territory is singularly free from most of the infectious and contagious diseases which cause such heavy losses on the mainland, as well as throughout the world. The principal duty of the veterinarian will be to prevent the introduction of such diseases not already here and to devise means to eradicate those which have already gained a foothold in the Territory.

The Division of Agriculture, by Mr. Jared G. Smith, Special Agent in charge of the Hawaii Experiment Station, gives an important account of the Hamakua tobacco experiments, which are still in progress. This feature of local agricultural development is of particular importance, and from the results shown, it appears fair to predict that this industry, together with the cultivation of rubber, will soon rank in Hawaii as of equal importance as the production of coffee. Interesting information is also given relating to the following crops: Mango, banana, cacao, vanilla, rosella, avocado, rubber and coffee. The report concludes with an account of the work of the chemical laboratory of the station.

We hope that all readers who have not already received a copy of this valuable publication will avail themselves of the offer of the Board of Agriculture to forward it upon request. The work contains two hundred and forty pages of interesting information, and is well illustrated. It is of importance alike to the general agriculturist, the stock breeder, the fruit grower, and the entomologist.

WAIANAE-KAI AND LUALUALEI FOREST RESERVES.

Official action has recently been taken upon two important forest projects on the Island of Oahu, the proposed forest reserves of Waianae-kai and Lualualei. The two areas adjoin one another and in reality form one reserve. They may accordingly be considered as a unit, although taken up at different times by the Board of Agriculture and Forestry. Both reserves are situated on the western slope of the Waianae

mountains and with the exception of a few kuleanas in the Waianae-kai reserve consist wholly of government land. The area of the Waianae-kai Forest Reserve is 3257 acres, that of Lualualei 3743.

The reports regarding the Waianae-kai Forest Reserve were adopted and the resolution recommending its creation passed by the Board at its meeting held on August 8th, 1906, while similar action in regard to Lualualei was taken on October 31st, 1906.

The public hearing to consider the Waianae-kai Forest Reserve was held on September 5th, and on September 7th Governor Carter issued the proclamation officially setting the land apart.

The Lualualei hearing was held on November 28th. The proclamation of that reserve is dated November 30, 1906.

In accordance with the usual custom of the Board the reports of the Committee on Forestry (two) and of the Superintendent of Forestry (two) with the resolutions (two) adopted by the Board in regard to these two reserves are published herewith. There is also published a form of surrender signed by the Waianae Company whereby the control of the land of Waianae-kai reverts to the government on July 1st, 1908. This action was taken in order to enable the Governor to set apart the reserve under the two-year clause of the law, and also to allow new arrangements to be made for the use of the water from the reserve. It is the first time that such a step has been taken and is eloquent testimony as to what a leading plantation company thinks of the value of forest reserves.

RESOLUTION RELATING TO THE PROPOSED WAIANAË-KAI FOREST RESERVE.

Resolved, that those certain lands in the District of Waianae, Island of Oahu, bounded in general terms, as follows:

Lying on the West and North slope of the Waianae valley, bounded on the West by the land of Makaha, on the North by the land of Waianae-uka, on the East and South by a line drawn approximately along the foot of the steep mountain slope; and containing an area of 3,150 acres, more or less, as recommended by a report of the Committee on Forestry, dated August 8th, 1906, based on reports of the Superintendent of Forestry, dated April 4th and July 31st, 1906, which reports

are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map and description made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map Number 2372" and "Forest Reserve Waianae Valley, Waianae-kai, Oahu," copies of which said map and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Waianae-kai Forest Reserve."

Resolved, that the Board recommend to the Governor that the government lands lying within the boundaries of the said proposed Waianae Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the "Waianae-kai Forest Reserve."

This resolution was adopted by the Board of Agriculture and Forestry on August 8, 1906.

RESOLUTION IN REGARD TO THE PROPOSED LUALUALEI RESERVE.

Resolved, that those certain lands in the District of Waianae, Island of Oahu, bounded in general terms as follows:

Lying on the western slope of the Waianae Mountains, bounded on the west by the Lualualei Homesteads, on the north and east by the lands of Waianae-kai, Waianae-uka and Honouliuli, on the south by the land of Nanakuli; and containing an area of 3,743 acres, more or less, as recommended by a report of the Committee on Forestry, dated August 10, 1906, based on a report of the Superintendent of Forestry, dated April 4, 1906, which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map made in January, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map Number 2165" and "Lualualei Forest Reserve, Oahu," and a description accompanying the same number C. S. F. 1659, which said description is on file in said Survey Department, copies of which said map and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Lualualei Forest Reserve."

Resolved, that the Board recommends to the Governor that the government lands lying within the boundaries of said proposed Lualualei Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the "Lualualei Forest Reserve."

This resolution was adopted by the Board of Agriculture and Forestry on October 31, 1906.

REPORTS OF THE COMMITTEE ON FORESTRY.

WAIANAE-KAI.

Honolulu, T. H., August 8, 1906.

Board of Agriculture and Forestry,
City.

Gentlemen: Your Committee on Forestry hereby report upon the proposed forest reserve on the land of Waianae-kai, District of Waianae, Island of Oahu, recommended by Forester Hosmer by report dated July 31, 1906.

Your committee are familiar with the locality in question and have consulted the leading property owners in that vicinity. The land included in the proposed forest reserve is, with the exception of a few kuleanas, all government land under lease to the Waianae Plantation, which lease has about three years to run.

The proposed reserve is the mountain country on the ridge between the valley of Waianae and Makaha and also runs along the Kaala ridge dividing Waianae from the basin in which Wahiawa is located.

The land covered by the proposed reserve is, most of it, almost inaccessible and is, all of it, suitable for forest reserve purposes. It constitutes the water shed of the entire Waianae valley and also affects the water shed of the North and East slope of the Waianae Range.

The Waianae Plantation has signified its willingness to surrender its lease on the proposed reserve for the purpose of securing the establishment of the proposed reserve and will at its own expense run a fence along the lower line of the reserve to keep out horses and cattle.

The plantation has already fenced out the upper portion of the proposed reserve and planted many trees thereon and has signified its desire and willingness to continue planting trees

on the enlarged reserve at its own expense and under the supervision of the forester.

Your committee commend the public spirited attitude and the enlightened methods shown by the Waianae Plantation in this connection.

Your Committee recommend that the Board approve of the proposed forest reserve and recommend the same to the Governor in the usual form.

Your Committee presents herewith a resolution carrying the foregoing recommendations into effect.

The Forester suggests that in the proclamation a reservation be made allowing outing house sites to be located on the land in question.

Your Committee are of opinion that such reservation is unnecessary but can be accomplished under the power of the Board to make rules and regulations concerning the administration of forest reserves.

We remain,

Your obedient servants,

L. A. THURSTON,
W. M. GIFFARD,
Committee on Forestry.

LUALUALEI.

Honolulu, T. H., Aug. 10, 1906.

Board of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the report of the Superintendent of Forestry, dated April 4, 1906, concerning the proposed forest reserve at Lualualei, District of Waianae, Island of Oahu.

This proposed reserve is adjacent to and directly east of the Waianae-kai reserve, which was approved by this Board on the 8th inst.

It extends along the crest of the Waianae mountains from Waianae-kai to Nanakuli, and from the crest down into the head of the Lualualei Valley to the homesteads recently sold by the Government. It embraces the steep foot-hills of the Lualualei Valley and the mountain above the same to the crest. It is the direct water shed of the Lualualei Valley, which is

practically an extension of the Waianae Valley, and is the sole source of water supply for the homesteads and ranches in Lualualei.

The land in question is all government land on which there is no lease.

It has been surveyed by the Territorial Survey Department and the metes and bounds accompany the recommendation of the Superintendent of Forestry. The proposed reserve contains an area of 3,743 acres. It is the unanimous opinion of the land owners, of the Land Commissioner and of every one that your Committee knows of that the land in question should be made into a forest reserve.

Your Committee therefore recommend that the recommendations of the Superintendent of Forestry to establish a forest reserve on the land of Lualualei in the locality indicated, be approved by this Board and that the same be recommended to the Governor for reservation as a forest reserve.

Your Committee herewith submit a formal resolution carrying the foregoing recommendations into effect.

We remain,

Your obedient servants,

L. A. THURSTON,
W. M. GIFFARD,
Committee on Forestry.

REPORTS OF THE SUPERINTENDENT OF FORESTRY.

April 4, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to submit herewith a partial report upon the creation of a forest reserve on the mauka portion of the government lands of Lualualei and Waianae-kai, in the District of Waianae, Island of Oahu, and to recommend certain lines as the boundary of the proposed reserve. A technical description of the boundary of the area in Lualualei proposed to be set apart forms a part of this report. Following the completion by the Survey Office of a like description for the area in Waianae-kai, I shall submit a supplementary report upon that land. The matter may therefore be brought

before the Governor in the form of two reserves, or action on Lualualei can be postponed until the Waianae-kai description is ready.

The present report is made in response to a verbal request from the Commissioner of Public Lands, in order that the forest line on Waianae-kai may be laid out by the Survey Office in connection with other work in the Waianae Valley. It is based on field work done in Lualualei and Waianae-kai in December, 1905, and March, 1906, respectively, when I carefully inspected the two valleys, as well as on information obtained from various persons familiar with the local conditions, or gathered by me while examining adjacent lands.

Situated on the leeward side of Oahu, under the shelter of Kaala, the highest peak of the Waianae Range—and also, incidentally, the highest elevation on Oahu, 4030 feet—the lands of Waianae-kai and Lualualei resemble in topography and are subject to the same general conditions of exposure and rainfall as obtain on the lands of Makua and Keaaui, 8 to 10 miles along the Waianae Coast to the northward. As a somewhat detailed report has recently been submitted by me upon these lands* it is unnecessary to repeat here the general statements

PURPOSE.

The essential reasons for the creation of a forest reserve on the Lualualei and Waianae-kai lands are, by the re-establishment and maintenance of a forest cover, to assist in securing a more regular flow in the springs and brooks on the lands, and to put to economic use areas which from their topography and situation are incapable of being profitably used for any other purpose than producing trees. Much of the proposed reserve is indeed too steep and rough even for this use, but by making it a forest reserve it will later be possible to put into effect a comprehensive system of forest management, which will include the systematic extermination of the wild goats and, in cooperation with the owners or lessees of adjoining lands, a definite policy of tree planting.

* This Report was published in the Hawaiian Forester and Agriculturist for January, 1906, pp. 4 to 8, contained therein.

LOCATION AND AREA.

The section proposed to be reserved includes the area at the head of the two valleys, above the homesteads in Lualualei and above the cultivated area in Waianae-kai. The Lualualei tract may be roughly described as follows:

Lualualei: That portion of the land of Lualualei, District of Waianae, Island of Oahu, lying on the western slope of the Waianae Mountains, bounded on the West and Southwest by the mauka line of the Lualualei Homesteads, on the East and Northeast by the summit ridge of the Waianae Mountains, and on the Northwest and Southwest, respectively, by the summit ridge of the spurs dividing Lualualei from Waianae-kai and from Nanakuli.

Waianae-kai: That portion of the land of Waianae-kai, District of Waianae, Island of Oahu, lying on the Western slope of the Waianae Mountains, bounded on the Southwest and South by a line drawn from Kawaopuu to Puu Kolealiilii, thence to and along the foot of the ridge dividing Waianae-kai from Makaha to the Makaha boundary; on the Northeast by the summit ridge of the Waianae Mountains, and on the Northwest and Southeast, respectively, by the summit ridge of the spurs dividing Waianae-kai from Makaha and Lualualei.

The area of the proposed Lualualei Reserve is 3,743 acres. That of Waianae-kai I do not know, but it is perhaps two-thirds that of Lualualei. Both of the lands were formerly classed as "Crown lands."

DESCRIPTION OF THE TRACTS.

As each valley presents some individual problems it may be well to consider them separately.

Lualualei.

The characteristic features of the Lualualei Forest Reserve project are the fencing problem and the existence of a public way across the area.

When the Lualualei homesteads were sold one of the provisions was that the mauka line of each lot adjoining the forest area should be fenced. The period during which this work must be done does not expire for about twenty months yet. So far none of the mauka fences have been built although

practically all of the lot owners are ready, each to fence his own lot provided all the other owners will agree to fence theirs at the same time. It is therefore merely a question of time when the work is done. As the other three sides of the reserve are bounded by mountain ridges further fencing along the boundary is unnecessary, except perhaps a short stretch on the ridge at the Kolekole Pass.

The question of fencing the trail across the reserve is, however, not so easily solved. This trail is the one leading from Waianae over the Kolekole Pass to Leilehua Ranch and beyond, and having been used from time immemorial is a recognized public way. The lower end of the trail, just above Homestead Lot No. 2, has recently been improved by the Oahu County Supervisors, but whether or not the whole length of the trail is to be put in shape I cannot say. Being a public way, it is of course impossible to close the trail and even if it were possible to do so I should not recommend it, for the trail is one that is needed in the domestic traffic of the island. Parenthetically it may be remarked that this trail possesses unusual scenic advantages, which when the trail is put in shape would, if properly advertised, make it a tourist attraction.

The objection to the trail crossing the reserve is that there is now nothing to prevent cattle from straying from it when being driven across. Ordinarily of course a band would be kept together and driven right through; but if it were so desired, in the absence of fences the cattle might be allowed to scatter and roam at will over the reserve. The only sure way to remedy this is to fence both sides of the trail from Kolekole Pass to the Homestead Lots, leaving open a suitably wide right of way. This means a double line of fence for a distance of perhaps a mile and a half. This Board certainly has no money for such a purpose and I see no way to obtain the money except by an appropriation by the Legislature.

A temporary solution of the difficulty could, I think, be effected by securing the coöperation of the few companies or individuals who are accustomed to use this trail to drive cattle across the mountains, whereby they would agree to keep the band together and drive them right through. If this could be arranged, the forest ranger for the district, who it is expected

can be appointed next year, could do much to keep ordinary strays in check.

For these reasons I believe that the present lack of ability to fence in the trail should not stand against the creation of this area as a forest reserve.

It has been suggested by certain gentlemen interested in the Lualualei homesteads that a trail should be laid out above the homestead lots to connect Lots 3 to 7 with the regular trail over the Pass. But as the mauka line of the homesteads in several places runs to steep ridges, over which it is impracticable to build a trail, it would be necessary that such a trail be laid out across rather than above the homestead lots.

While some of the land above the homesteads in Lualualei could be and now is used for grazing it is believed that it would be of greater benefit not only to the Territory as a whole, but also to those persons having interests in Lualualei Valley, to have this section covered with forest. Above the homesteads there are a number of springs, some of which have in late years run dry. There is no reason to doubt that were the slopes above these springs again forested, water could be developed from them. It is true that the catchment area is limited, but if the retentive cover of vegetation that goes to make up the forest were restored a good share of the rain that does fall would be saved and could be turned to account. So too a forest cover on these upper slopes would assist in holding some of the flood water which in times of heavy rain is now lost.

I understand that the mauka line of the Lualualei Homesteads was fixed where it is by the personal direction of ex-Governor Dole, with special reference to this very forest question at a time when there was more forest than at present upon these lands. From evidence in the gulches and elsewhere there seems to be no doubt that if protected from cattle the area would again become covered with trees. It seems to me that the mauka line of the homesteads is the best line which could be chosen and I accordingly recommend it as the lower line of the Lualualei Forest Reserve.

Recommendations.

As the area proposed to be reserved is government land not now under lease it can be declared a reserve and set apart by

the Governor at any time. For the reasons stated above I recommend that the Board take the requisite action to cause this area to be set apart as the Lualualei Forest Reserve.

Below is the technical description of the proposed Lualualei Forest Reserve boundary, prepared by Mr. F. E. Harvey of the Survey Office. It may be noted that the area of the reserve, 3,743 acres, is less than the balance of Lualualei not under lease, called for in the last Land List. This is accounted for by the fact that the reserve does not take in certain lands makai and to the Southwest of Lot No. 7. Following is the description:

[The technical description is here omitted as it will later be published as a part of the official proclamation.]

The original of the above description is filed in the Territorial Survey Office as C. S. F. 1659. The area is 3,743 acres.

Waianae-kai.

In Waianae-kai the water question is also the predominant one and forms the reason for the creation of a forest reserve in this valley. In this case the water is needed for the development of power and the irrigation of cane on leased government land. Some water is also needed for use on various native kuleanas. The whole land of Waianae-kai is now under lease to the Waianae (Plantation) Company—to run until July 1, 1909—but as the lessees are desirous of effecting a new settlement some arrangement as to the setting apart of the forest land can probably be arrived at before the two-year limit, by the surrender of a part of the land leased or otherwise. The total area of Waianae-kai is 5,510 acres. The area of forest and waste land is approximately 3,000 acres.

It is the desire of the plantation that all the land above a line drawn from Kawaopuu to Puu Kolealilii and from the latter point to the pumping station at the makai end of the ridge making the Northern side of the valley, be created and set apart as a forest reserve. At present some of the upper land is used for grazing cattle belonging to the plantation but this department is soon to be given up and the cattle removed.

In fixing the forest line the question of the availability of any of the upper land for agriculture was carefully considered. Above the line recommended in this report there is, with the exception of the old coffee plantation to be discussed later, no

land now under cultivation, and so far as I could learn, with the exception of a few kuleanas now owned by the plantation, the only use to which the land had for many years been put, was grazing.

On the upper South side of the valley, next to the Kawaopuu ridge, the land rises more gradually than elsewhere and could perhaps be used for some crop, but here comes in the question of a water supply for, if this section were so used, water would have to be diverted from use on much better land below, the wisdom of which is at least questionable. Furthermore as the elevation of this moderately sloping land is greater than the elevation of the power house, the diversion of water would also interfere with that use, while for the land lower down the valley the water that has already turned the power wheels can be used for irrigation.

Almost all of the land within the area proposed to be reserved is rocky and on the Northwestern side of the valley most of it is in addition covered with a heavy growth of cactus. The cactus belt extends all the way from the pumping station along the base of the ridge, up the valley to Puu Kolealiilii, coming down to the cane fields or to the road. At the upper end stone walls have been built within the last few years to keep the cattle out of the cactus. These walls could well be utilized as the actual forest reserve boundary, although to provide for a time when some use may be found for this easily accessible though rocky and now cactus covered land, the official line should run from Puu Kolealiilii to the most Northerly point of the cane fields. One of the stone walls runs from Puu Kolealiilii to an enclosure known as the "Bullock Pen," on the main road up the valley, where it meets another wall enclosing the cane fields lower down.

Lower down the valley the land above the proposed forest line is too rocky to be used for any economic purpose, while that further mauka should, it is believed, for the reasons already pointed out, be kept as forest.

In the upper part of the Waianae Valley is the old coffee plantation established by the late Judge H. A. Widemann. As a profitable venture coffee growing has not proved a success, although large sums have been expended in attempts to make it so. The plantation has now been practically abandoned

although for the last few years a few Japanese have picked the crop on contracts, usually at a loss to the Waianae Company. The fruit trees seem to have fared no better so that from a financial standpoint the experiment must be counted a failure.

As a mountain outing place the lot has possibilities, however, and I see no reason why it should not be so used. The presence in the forest reserve of such a place, well kept up and cared for, would insure better protection against forest fire, for one or more men would be always at hand in case of an emergency of that kind. Furthermore by keeping the road and trails open regular fire fighting gangs could be got in quickly should that be necessary.

If the place were to be sold or leased—and it seems a pity after so much money has been spent that it cannot be turned to account in some way—it would be well to have clauses in the deed or lease making it obligatory on the owner or lessee to conform to certain simple regulations and assist in times of need in protecting the reserve from fire.

Of the other coffee plantation in Waianae, sometime owned by Mr. Carl A. Widemann, there are left so few traces that had not some exotic trees been planted the stranger would search for it in vain.

In connection with the creation of the upper part of the Waianae Valley a forest reserve, the Waianae Company is ready to consider carrying into effect a plan to reforest certain of the upper lands, within the reserve, by systematic tree planting. Just where and how much of this work would be done cannot now be told, but if once started it is probable that considerable areas would be planted. On the lower lands and especially among the cactus it would be a good thing to extend the algaroba forest and in many places this could easily be done by pasturing out a few horses fed in part on algaroba pods.

Recommendations.

For the reasons above set forth I therefore recommend that when a technical description of the boundary is in hand, the Board pass a resolution favoring the reservation of the upper part of the land of Waianae-kai as the Waianae-kai Forest Reserve, and requesting the Governor to set apart the land for

that purpose, as by that time a definite arrangement will, without doubt, have been reached with the Waianae Company regarding the surrender of their present lease. As soon as a technical description is prepared by the Survey Office I will submit it as a supplementary report. In the meantime I submit the following popular description of the proposed line:

Starting at Kawaopuu on the Lualualei-Waianae-kai boundary, the line should run in a Northwesterly direction to Puu Koealilili, thence in a general Southwesterly direction to the most Northerly point of the cane fields, where the power wire line leaves the cane and enters the cactus; thence makai along the stone wall bordering the cane fields to a point on the edge of a dry gulch where the said wall turns abruptly to the East; thence along the top of the Southern bank of said dry gulch to the East end of the wooden trestle crossing it, which trestle is on the upper flume line, the second north from the main road; thence following the flume line, or a line parallel to and 50 feet, more or less, mauka of it to the pumping station; thence on the same contour to the Waianae-kai-Makaha boundary; thence mauka following said boundary line to the crest of the Waianae Range; thence along the summit ridge to the spur on which is Puu Kawaopuu, thence down said spur to the initial point.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

WAIANA-KAI.

July 31, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to submit the following as a supplementary and final report upon the proposed forest reserve on the land of Waianae-kai, District of Waianae, Island of Oahu, covering and including the technical description and enclosed map prepared by the Territorial Survey Office, in accordance with the recommendations in my report to you dated April 4th, 1906.

I would here add one recommendation to those contained in my preliminary report. In that report I stated that in my judgment there would be no impropriety in using the old coffee plantation of the late Judge Widemann as a mountain outing place, provided it were made mandatory for the lessee to observe certain simple regulations looking to the welfare of the forest reserve. There is opportunity on the government land in the vicinity of this grant to lay out one or more small lots which could be used for a similar purpose. If restricted by properly worded clauses in the lease or deed I believe that the use of a limited area of the proposed reserve for outing house sites would be a benefit rather than a detriment to the reserve, as well as in part meeting what seems to be an increasing demand on this island. As no locations have as yet been made I recommend that a clause be inserted in the reserve proclamation, excepting from the reserve such limited areas, not to exceed 100 acres in all, in the vicinity of Grant No. 4040, as may hereafter be laid out under the direction of the Superintendent of Forestry for lease or sale as mauka outing house lots.

As the necessary data in regard to the proposed Lualualei and Waianae-kai Reserves are now in hand, I recommend that a resolution in regard to the creation of these reserves be prepared and presented to the Board by the Committee on Forestry, that these projects may be brought to the attention of the Governor and take the usual course.

Following is the description of the proposed Waianae-kai Forest Reserve boundary prepared by the Government Survey Office, where the original is filed as C. S. F. No. 1737.

[The technical description is here omitted, as it forms a part of the official proclamation.]

Kuleanas and Grant in above Reserve, viz.:

	Acres.
L. C. A. 3087 to Kanepaina, area.....	5.
L. C. A. 3131 to Kuapuu, area.....	3.136
L. C. A. 3133 to Ohule Ap. 1, area.....	5.655
Grant 4040 to H. A. Widemann, area.....	93.
	<hr/>
	106.701

Total area of Reserve.....	3257.000
Less	106.791
Balance	3150.209

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

SURRENDER OF LEASE OF WAIANAE-KAI.

This Indenture, made this 4th day of September, 1906, by and between Waianae Company, an Hawaiian corporation, of the first part, and J. W. Pratt of Honolulu, Island of Oahu, Territory of Hawaii, Commissioner of Public Lands for the Territory of Hawaii, of the second part,

Witnesseth: That the parties hereto do hereby mutually covenant and agree that the term of that certain indenture of lease dated the 11th day of September, 1879, made between The Commissioners of Crown Lands of the first part and H. A. Widemann of the second part, and of record in liber 63, pages 41-44, Hawaiian Registry of Conveyances (being Government lease No. 60), which term was for twenty-five years from July 1, 1879, and thereafter extended for five years to commence from the first day of July, 1904, shall be reduced one year so that such term as extended shall expire on the first day of July, 1908, and the said lease shall hereafter be read and construed as if the term of the said lease with the five years' extension were twenty-nine (29) years instead of thirty (30) years.

In Witness Whereof the parties hereto have hereunto and to another instrument of the same date and tenor set their hands and seals the day and year first above written.

WAIANAE COMPANY,

By its Vice-President,
J. O. Carter,

(Seal)

By its Secretary,
J. M. Dowsett.

(Seal) Jas. W. Pratt,
Commsr. Pub. Lands, T. H.

MAUI FOREST LAND SURRENDER.

November 12, 1906, is entitled to be regarded as an important date in the forest history of Hawaii, for on that day were signed the final papers in a coöperative agreement whereby an area of privately owned forest land within an Hawaiian forest reserve was for the first time turned over to the Board of Agriculture and Forestry for management.

The lands of which the care, custody and control are relinquished are in the Koolau Forest Reserve on Maui and are owned by the plantations controlled by Alexander & Baldwin. The surrender is made under the authority of Section 384, Chapter 28, of the Revised Laws of Hawaii, which provides that "any person or persons, corporation or corporations, may at any time surrender to the government the care, custody and control of any lands, whether held under lease or in fee, as a forest reservation, either for one or more years or forever. No taxes shall be levied or collected upon any private land so surrendered for the purposes aforesaid, so long as the same shall remain exclusively under the control of the government as a forest reservation."

The lands now turned over to the Board have for a number of years been treated as a private forest reserve, but when the Koolau Forest Reserve was created by proclamation of Acting Governor Atkinson on August 24, 1905, Mr. H. P. Baldwin agreed to coöperate with the government so that an organic plan of forest management might be put into operation for the reserve as a whole. Accordingly the matter was turned over to his attorneys, Messrs. Smith and Lewis, with the result that there have been prepared and finally executed three transfers, respectively from the Paia Plantation, the Haiku Sugar Company and the Hawaiian Commercial & Sugar Company. As the three documents are identical in all essential points, except for the difference in names, only one is reproduced here, that of the Paia Plantation.

While formidable in legal phraseology, the purpose of these documents is simple. The gist of the matter is that the plantations turn over to the government for the term of seventeen years from February 26, 1906, the care, custody and control of the privately owned lands of Halehaku, Haiku, Opana and

Kaupakalua within the boundaries of the Koolau (Maui) Forest Reserve. They except and reserve, however, (1) all water rights, (2) rights of way for roads, ditches, tunnels and pipe lines, (3) the right to plant trees, (4) the right to cut fence posts for local use, and (5) the right to make economic use of the forest subject to reasonable rules and regulations of the Board of Agriculture and Forestry and in a way not inconsistent with the purposes of the reserve. Under each of these reservations are included the rights of ingress and egress. The plantations agree, in addition, to keep the makai boundary of the reserve fenced.

The surrender is made contingent on the following points: (1) that the land surrendered be used by the government solely for forest purposes, (2) that all government lands within the reserve be set apart now or as soon as may be as parts of the reserve, (all those that can be reserved under the law have already been set apart), (3) that if all or any portion of the two tracts of government land covered by Leases Nos. 538 and 539 revert to the government during the seventeen years, such lands shall be added to the reserve, and (4) that all government lands within the reserve shall be used only for forest purposes during the period of the surrender, except that the government may exercise similar rights to those reserved to the plantations. Failure on the part of the government to comply with these conditions nullifies and terminates the whole agreement. The term of seventeen years expires on the same day as do the leases (Nos. 538 and 539) for the government lands adjoining the private lands surrendered.

Owing to the number of corporations involved it appeared necessary to make use of the elaborate form followed. In many cases it is probable that a very much simpler agreement would answer the purpose and be equally satisfactory. Already several individuals and corporations are preparing to enter into arrangements similar in scope and purpose to that here described. It is earnestly to be hoped that many others will follow suit, for only by the systematic coöperation of the owners of private forest land with the government in the management of the reserves as a whole can the forest reserves of Hawaii be made in the fullest degree to accomplish the ends for which they are created.

Following is the full text of the agreement between the Paia Plantation and the government :

THIS INDENTURE, made this 20th day of August, 1906, by and between PAIA PLANTATION, an Hawaiian corporation, party of the first part, the TERRITORY OF HAWAII, party of the second part, and PAIA PLANTATION, HAIKU SUGAR COMPANY, KALIALINUI PLANTATION COMPANY, LIMITED, PULEHU PLANTATION COMPANY, LIMITED, KULA PLANTATION COMPANY, LIMITED, MAKAWAO PLANTATION COMPANY, LIMITED, and KAILUA PLANTATION COMPANY, LIMITED, all Hawaiian corporations, a co-partnership under the name of the MAUI AGRICULTURAL COMPANY, said parties being hereinafter referred to as the Maui Agricultural Company, parties of the third part;

Whereas, a large portion of the lands situate in the districts of Hamakualoa and Koolau, Island of Maui, Territory of Hawaii, is covered with forest, and the chief value of said lands lies in the water conserved by said forest, which said water supplies the central Maui sugar companies, including said Paia Plantation; and

Whereas, said forest is situate on land principally owned by said Territory of Hawaii, which derives a large revenue from rents and from water license fees for the water obtained therefrom; and

Whereas, large areas of said districts are also owned by said Paia Plantation, the Haiku Sugar Company, an Hawaiian corporation, and the Hawaiian Commercial and Sugar Company, a California corporation; and

Whereas, it is to the interest of said Territory of Hawaii and said Paia Plantation, Haiku Sugar Company and Hawaiian Commercial and Sugar Company, and of the general public that said forest lands be maintained and forest reserves established thereon; and

Whereas, it has been agreed between said Territory and said Paia Plantation, Haiku Sugar Company and Hawaiian Commercial and Sugar Company that a forest reserve shall be set apart in said Districts of Hamakualoa and Koolau, Island and Territory aforesaid, within the boundaries hereinafter specifically set forth; and

Whereas, by due procedure according to law, the Acting Governor of the Territory of Hawaii did, on the 24th day of August, 1905, establish and describe a Forest Reserve in the said Districts, and duly issue a proclamation dated August 24th, 1905, setting apart and describing said Forest Reserve by metes and bounds, as more fully appears by said proclamation on file in the office of the Governor of the Territory of Hawaii, and by the map of said Forest Reserve on file in the territorial survey office C. S. F. 1630, which said proclamation and map are hereby referred to for greater certainty; and

Whereas, said Maui Agricultural Company, by and under that certain Partnership Agreement between them, dated October 30, 1903, have or may have acquired some rights or interests in the lands of which the care, custody and control are hereby surrendered to said Territory by said Paia Plantation within said boundaries, or in respect thereof;

NOW THEREFORE, THIS INDENTURE WITNESSETH, that said Paia Plantation, in consideration of the premises and of One Dollar (\$1) to it paid by said Territory of Hawaii, the receipt whereof is hereby acknowledged, does hereby surrender for forestry purposes unto said Territory of Hawaii the care, custody and control of all that portion of the land of Halehaku, of the land of Opana and of the land of Kaupakalua, lying within said boundaries owned by said Paia Plantation, as well as all other lands and portions of land lying within said boundaries owned by said Paia Plantation, said boundaries being particularly described as follows, to-wit:

Beginning at a point on the boundary line between the Districts of Hana and Koolau, Island of Maui, Territory of Hawaii, where the mauka boundary of the Nahiku Homesteads if projected easterly would intersect the said District line, the boundary runs:

1. In a general northwesterly direction to and along the mauka boundary of the Nahiku Government Homesteads to the gulch between the land of Kapaula and Puakea, or Paakea, said gulch being also named Waiaka Gulch on Public Lands Map No. 20 of Nahiku, about 22,000 feet in a direct line;

2. Thence makai, down said Waiaka Gulch to the Koolau Ditch, about 2800 feet in a direct line;

3. Thence in a general westerly direction along the Koolau and Upper Hamakua Dutch trail to the western boundary of the land of Opana, in the District of Hamakualoa, about 61,000 feet in a direct line;

4. Thence mauka along the westerly boundary of said Opana to the makai boundary of the land of Haiku-uka, belonging to the Haiku Sugar Company and Paia Plantation, about 20,000 feet in a direct line;

5. Thence in a general westerly direction, along the makai boundary of the said Haiku-uka land of the Haiku Sugar Company and Paia Plantation, to the Moliko Gulch, near Pali o Ka Moa, about 2000 feet in a direct line;

6. Thence south 34° east, true 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakao;

7. Thence south $53^{\circ} 21'$ east, true 42,980 feet, along the land of Kaliainui, crossing the Koolau Gap, to Pohaku Oki Aina;

8. Thence, in a general easterly direction, along the northern crest of the Kipahulu Valley to a point where the boundary line between the Districts of Koolau and Hana intersects the Kipahulu Valley, about 10,000 feet in a direct line;

9. Thence, in a general northeasterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point of beginning, about 21,500 feet in a direct line, containing an area of 42,969 acres, more or less, the various distances in the above description being approximate only, being scaled from the said map showing the Reserve boundary;

TO HAVE AND TO HOLD the care, custody and control of the said surrendered premises for forestry purposes unto said Territory of Hawaii for a period of seventeen years from the 26th day of February,

1906, *subject*, however, to the terms of that certain deed of mortgage and trust executed by said Paia Plantation to the Hawaiian Trust Company, Limited, dated September 28, 1903, recorded in the office of the Registrar of Conveyances, in Honolulu, Island of Oahu, Territory of Hawaii, in Liber 251, on pages 179-208, to secure the payment of bonds issued thereunder;

EXCEPTING AND RESERVING unto said Paia Plantation, and its successors and assigns, from the said surrendered premises and from the operation of this surrender, however, all water rights, and the right to develop for additional water in and upon said lands for any purpose whatsoever;

And also full right of ingress and egress, and rights of way for ditches, roads, pipe lines and tunnels and any other device for the purpose of developing and removing said water, and doing any work incidental thereto, said rights of ingress and egress and rights of way to extend from every point upon said lands to every place bounding said lands.

And also the right to plant such trees and shrubs on said surrendered lands as it, said Paia Plantation, may desire, and the right of ingress and egress for that purpose;

And also the right to cut fence posts upon said lands for fencing any of said surrendered lands, and the right of ingress and egress for the purpose of securing such fence posts, as well as of constructing such fences;

And also the right to make economic use of the forest now or hereafter on said surrendered lands, subject to such reasonable rules and regulations for the protection and development of the forest reserve hereinafter provided for on said surrendered lands as may be made by the Board of Agriculture and Forestry of said Territory or such other department as may succeed to the functions of said Board, and also the right to use and enjoy said surrendered lands for any purpose not inconsistent with the establishment, use, maintenance and development hereinafter provided for of said lands as a forest reserve, such use of said forest and use and enjoyment of said surrendered lands to be made in such manner that will not materially interfere with the conservation of said water supply on said surrendered lands, as well as also the right of ingress and egress for such purposes, such rights of ingress and egress as well as all other rights of ingress and egress and rights of way herein reserved to extend from every point upon said surrendered lands to every place bounding said lands.

And the said Paia Plantation covenants with said Territory of Hawaii that it, said Paia Plantation, will during said period of seventeen years covered by this surrender, fence or cause to be fenced and will keep fenced or cause to be kept fenced the lands of which the care, custody and control are hereby surrendered along the makai boundary of said forest reserve, the boundaries of which said forest reserve being the same as the boundaries hereinbefore specifically set forth, wherever it is necessary so to do to exclude live stock from said forest reserve.

PROVIDED, NEVERTHELESS, AND THIS SURRENDER IS MADE UPON THE FOLLOWING EXPRESS CONDITIONS:

1. That the lands of which the care, custody and control are hereby surrendered shall be immediately set apart as a forest reserve for forestry purposes in accordance with the general purposes of the present forestry laws of the Territory of Hawaii.

2. That all lands now held and owned by said Territory of Hawaii and that it may hereafter acquire during said period of this surrender, upon such acquisition, within said boundaries hereinbefore specifically set forth, *except* the lands within said boundaries covered by Government Leases Nos. 538 and 539, both dated February 26, 1902, made by the Commissioner of Public Lands for and on behalf of the Territory of Hawaii to H. P. Baldwin, shall likewise be immediately set apart as a forest reserve for said purposes, as far as and as soon as it is able so to do under the laws of said Territory;

3. That at least immediately upon the relief or release within said period of this surrender of all, or any part, of the lands covered by said Government Leases Nos. 538 and 539, from said leases, or either of them, by expiration or termination or otherwise, the lands within said boundaries so relieved or released shall be set apart as a forest reserve for said purposes; *but*, if possible under the laws of said Territory at any time within said period of this surrender before such relief, release or releases, then as soon as thus possible, the lands within said boundaries covered by said leases shall be set apart as a forest reserve for said purposes;

4. That all lands set apart as hereinbefore specified as a forest reserve and all lands now held, controlled or owned by said Territory of Hawaii, within said boundaries that have already been set apart as a forest reserve for said purposes, shall be used and maintained during said period of seventeen years covered by this surrender as a forest reserve for forestry purposes according to the general purposes of the present forestry laws of the Territory of Hawaii, except where such use and maintenance will be inconsistent with the rights now existing of third persons in any of said lands, in which cases, upon the termination of any such right or rights, such use and maintenance shall immediately being in the lands relieved therefrom and shall thereafter continue throughout said period of seventeen years covered by this surrender:

Excepting and Reserving, however, to said Territory of Hawaii from all lands owned by said Territory that said Territory has, or may, set apart as a forest reserve according to the terms of this surrender, the following rights to the extent that such rights are now owned or held by said Territory and subject to all existing rights held or owned by, or belonging to parties, including the parties of the first and third parts hereto, other than said Territory;

All water rights and the right to develop for additional water in and upon said lands for any purposes whatever;

Full rights of ingress and egress, rights of way for ditches, roads, pipe lines and tunnels and any other device for the purpose of develop-

ing and removing said water, and doing any work incidental thereto, said rights of ingress and egress and rights of way to extend from every point upon said lands to every place bounding said lands and to all places beyond;

The right to plant such trees and shrubs on said lands as it, said Territory, may desire, and the right of ingress and egress for the purpose;

The right to cut fence posts upon said lands for fencing any of said lands, and the right of ingress and egress for the purpose of securing such fence posts as well as of constructing such fences;

The right to make economic use of the forest now or hereafter on said lands, subject to such reasonable rules and regulations for the protection and development of the forest reserve herein provided for on said lands as may be made by the Board of Agriculture and Forestry of said Territory or such other department as may succeed to the functions of said Board, and also the right to use and enjoy said lands for any purpose not inconsistent with the establishment, use, maintenance and development herein provided for of said lands as a forest reserve, such use of said forest and use and enjoyment of said lands to be made in such manner that will not materially interfere with the conservation of said water supply on said lands, as well as also the right of ingress and egress for such purposes, such rights of ingress and egress, as well as all other rights of ingress and egress and rights of way to be reserved, as aforesaid, to said Territory, to extend from every point upon said lands to every place bounding said lands and to all places beyond.

BUT UPON ANY DEFAULT in the performance or observance of any of the foregoing conditions or any part thereof on the part of said Territory to be kept, observed and performed, said Paia Plantation, its successors or assigns, may thereupon, or at any time thereafter, notwithstanding any prior or other waiver of any prior breach of condition, with or without suit and without notice or demand, enter upon said lands hereby surrendered by said Paia Plantation and thereby determine the right to the care, custody and control hereby given to said Territory of Hawaii and resume entire possession of said lands, and the full use, enjoyment, care, custody and control thereof shall thereupon revert to and vest absolutely in said Paia Plantation, its successors or assigns, and its obligations under this indenture and said agreement with said Territory of Hawaii shall thereupon be discharged.

And said MAUI AGRICULTURAL COMPANY, in consideration of the premises and of One Dollar (\$1) to them paid by said Territory of Hawaii, the receipt whereof is hereby acknowledged, do hereby covenant and agree with said Territory of Hawaii that, as far as said Maui Agricultural Company are concerned and interested in said lands under said Partnership Agreement between said Maui Agricultural Company, dated October 30, 1903, hereinbefore referred to, the lands of which the care, custody and control are hereby surrendered by said Paia Plantation, may be set apart immediately by said Territory of Hawaii as a forest reserve for said purposes and said lands may be used and maintained as a forest reserve for said purposes during said period of this surrender, and

said Territory of Hawaii may have the care, custody and control of said lands for said purpose during said period.

EXCEPTING AND RESERVING, however, unto said Maui Agricultural Company and their successors and assigns, and from the operation of the foregoing covenant and agreement of said Maui Agricultural Company, all rights and interests that they have, or may have, by and under said Partnership Agreement in said lands, or in respect thereof, not inconsistent with the purposes or accomplishment or fulfillment of the objects as herein set forth of the surrender herein by said Paia Plantation, including within said exception and reservation all rights that said Maui Agricultural Company, would, or may, have under said Partnership Agreement in the rights reserved and excepted herein, and all exceptions and reservations herein made, by said Paia Plantation.

BUT UPON ANY DEFAULT in the performance or observance of any of the foregoing conditions, upon which the surrender of said Paia Plantation herein is made, or any part thereof, then the rights given by and under the foregoing covenant and agreement of said Maui Agricultural Company shall cease, *either* at and upon the election of said Maui Agricultural Company, said election to be evidenced by written notice thereof given by said Maui Agricultural Company, their successors or assigns, to the Governor of said Territory of Hawaii then holding office, and said Maui Agricultural Company may thereupon, notwithstanding any prior or other waiver or any prior breach of condition, without further notice, enter upon said lands and resume their rights therein and the use, enjoyment, care, custody and control thereof as they existed prior to said covenant and agreement, *or*, upon the consummation of the forfeiture of the rights by this indenture conferred by the entry of said Paia Plantation on account of breach of condition as hereinbefore provided.

IN WITNESS WHEREOF said Paia Plantation, party of the first part, has caused these presents to be executed and its corporate seal to be hereunto affixed by its proper officers thereunto duly authorized, and said Territory of Hawaii, said party of the second part, has caused these presents to be executed and its great seal to be hereunto affixed by George R. Carter, Governor, and James W. Pratt, Commissioner of Public Lands, and said Haiku Sugar Company, said Kalialinui Plantation Company, Limited, said Pulehu Plantation Company, Limited, said Kula Plantation Company, Limited, said Makawao Plantation Company, Limited, and said Kailua Plantation Company, Limited, which, together with said Paia Plantation are the parties of the third part hereto, have each of them caused these presents to be executed and their corporate seals to be hereunto affixed by their proper officers thereunto duly authorized, the day and year first above written.

(Seal) PAIA PLANTATION.

By (Sig.) H. P. Baldwin,
Its President.

and " J. Waterhouse,
Its Treasurer.

- (Seal) TERRITORY OF HAWAII.
 By (Sig.) G. R. Carter,
 Governor.
 and " Jas. W. Pratt,
 Commissioner of Public Lands.
- (Seal) HAIKU SUGAR COMPANY,
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KALIALINUI PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) PULEHU PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KULA PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) MAKAWAO PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KAILUA PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.

The words "and to all places beyond" were erased on 4th and 5th
 and 29th lines, page 5, before execution.

(Signed) JOHN GUILD, (Seal)
 Notary Public.

Territory of Hawaii, }
 Island of Oahu, } ss.

On this 22nd day of August, A. D. 1906, personally appeared before me G. R. CARTER, known to me to be the person described in the foregoing instrument, who executed the same by subscribing thereto the name of the TERRITORY OF HAWAII, and his own name as the GOVERNOR of said Territory; who acknowledged to me that he executed the same in the name and behalf of said Territory of Hawaii, as GOVERNOR thereof, freely and voluntarily, as the free act and deed of said Territory, for the uses and purposes therein set forth.

(Seal)

(Signed) JOHN GUILD,
 Notary Public,
 First Judicial Circuit.

Territory of Hawaii, }
 Island of Oahu, } ss.

On this 21st day of August, A. D. 1906, personally appeared before me H. P. Baldwin and J. Waterhouse, to me known, and by me known to be the President and the Treasurer, respectively, of each of the following Hawaiian Corporations, as described in the foregoing instrument by them executed as such Officers, to-wit: Paia Plantation, Haiku Sugar Company, Kalialinui Plantation Company, Limited, Pulehu Plantation Company, Limited, Kula Plantation Company, Limited, Makawao Plantation Company, Limited, and Kailua Plantation Company, Limited; and said H. P. Baldwin and J. Waterhouse severally acknowledged to me that they so executed said instrument freely and voluntarily, in the names and behalf of said corporations hereinabove named, as well in the execution thereof by said corporations as individual corporations as in their execution thereof under the name of Maui Agricultural Company, by themselves respectively as co-partners in said firm, in each case as the free act and deed of said several corporations, individually and as such co-partners, for the uses and purposes therein set forth.

Witness my hand and seal this 21st day of August, A. D. 1906.

(Seal)

(Signed) JOHN GUILD,
 Notary Public,
 First Judicial Circuit.

Territory of Hawaii, }
 Island of Oahu, } ss.

On this 4th day of October, A. D. 1906, personally appeared before me JAS. W. PRATT, known to me to be the person described in the foregoing instrument, who executed the same by subscribing hereto the name of the TERRITORY OF HAWAII, and his own name as COMMISSIONER OF PUBLIC LANDS of said Territory, who acknowledged

to me that he executed the same in the name and behalf of said Territory of Hawaii, as COMMISSIONER OF PUBLIC LANDS thereof, freely and voluntarily, as the free act and deed of said Territory, for the uses and purposes therein set forth.

(Seal)

(Signed) JOHN GUILD,
Notary Public,
First Judicial Circuit.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF WAIANAE, ISLAND
OF OAHU.

WAIANAE-KAI FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of government land lying on the West and North slope of the Waianae Valley, on the Island of Oahu, bounded on the West by the land of Makaha, on the North by the land of Waianae-uka, on the East and South by a line drawn approximately along the foot of the steep mountain slope, in the District of Waianae, Island of Oahu, Territory of Hawaii, more particularly described by and on a map made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked Registered Map Number 2372, and a description accompanying the same, numbered C. S. F. 1737, which said description now on file in said Survey Department, is as follows:

Commencing at the Government Survey Station Kawaopuu on the ridge between Waianae Valley and Lualualei, said Station being on the mauka side of the gap at Puea. From this Station the following Government Survey Stations bear by true azimuth: Kuwale $45^{\circ} 47'$, 3695 feet and Paheehee mauka $43^{\circ} 35'$, 11,147 feet and running thence by true azimuth as follows:

1. $162^{\circ} 1'$ 5426 feet across valley to a pile of stones on the South summit of Kolealiili. From this pile of stones the following Government survey Stations bear by true azimuth Paheehee mauka $24^{\circ} 26' 30''$, 14,512 feet, and Kuwale $7^{\circ} 10'$, 7778 feet;

2. $65^{\circ} 14'$ 953 feet down side of Kolealiili hill across stream and up bank of gulch to a cross cut on a smooth flat rock 8 feet North Easterly from corner of stone wall;

3. $69^{\circ} 51'$ 825 feet along stone wall crossing stream to a large rock at junction of stone walls. From the rock the following stations bear by true azimuth: Kawaopuu $323^{\circ} 29' 30''$, 5570 feet, and Kuwale $354^{\circ} 37'$, 7085 feet;

4. $33^{\circ} 27' 30''$ 5315 feet through cactus to a stone marked thus (arrow, horizontal) at edge of gulch and 22.5 feet Northerly from the North corner of stone wall enclosing cane field. From the above rock the following Stations bear by true azimuth Kawaopuu $270^{\circ} 28' 30''$, 6250 feet, Kuwale $306^{\circ} 8'$, 4448 feet, and Paheehee mauka $10^{\circ} 1'$, 8242 feet;

5. Thence $38^{\circ} 40'$ 22.5 feet to North corner of stone wall enclosing cane field and along stone wall on North side of cane and South edge of gulch to the end of the stone wall at fence, thence $25^{\circ} 40'$, 242 feet to a rock marked with a cross. The direct bearing and distance from rock marked thus (arrow, horizontal) to rock marked with a cross being $44^{\circ} 1'$, 2566 feet;

6. $67^{\circ} 8'$ 1383 feet to a stone marked thus (arrow, pendicular) on South edge of gulch and 54 feet from center of bend in flume from pumps at Kamaile to Lualualei. From this stone the following Stations bear by true azimuth: Kuwale $272^{\circ} 1' 30''$, 6656 feet, and Paheehee mauka $340^{\circ} 10'$, 5957 feet;

7. Thence in a Westerly direction parallel to and 50 feet North of the center line of the above flume to a cross on a rocky point on the Kamaileunu Ridge mauka of the pumps at Kamaile. The center line of the flume is located as follows: From the above mentioned rock marked thus (arrow, perpendicular) run by true azimuth $22^{\circ} 8'$ 54 feet to center of flume at bend. Thence along center line of flume.

1. $113^{\circ} 2'$ 825 feet across gulch and stream
2. $99^{\circ} 9'$ 350 feet across head of gulch
3. $95^{\circ} 12'$ 600 " " " " "
4. $96^{\circ} 14'$ 600 " " two gulches
5. $89^{\circ} 54'$ 650 " along head of gulch
6. $71^{\circ} 24'$ 700 " " side of Kamaileunu Ridge
7. $61^{\circ} 49'$ 850 " " " " " "
8. $69^{\circ} 39'$ 600 " " " " " "
9. $81^{\circ} 52'$ 300 " " " " " "
10. $94^{\circ} 14'$ 500 " " " " " "
11. $97^{\circ} 4'$ 300 " " " " " "
12. $106^{\circ} 47'$ 700 " " " " " "
13. $125^{\circ} 55'$ 300 " " " " " "
14. $104^{\circ} 23'$ 500 " " " " " "
15. $96^{\circ} 21'$ 100 " " " " " "
16. $72^{\circ} 55'$ 200 " " " " " "
17. $78^{\circ} 30'$ 100 " " " " " "

18. $101^{\circ} 42'$ 62 feet along side of Kamaileunu Ridge to the head of the pipe from the Kamaile pumps. Thence $128^{\circ} 50'$ 130 feet to above mentioned cross on Kamaileunu Ridge. From this cross the following Stations bear by true azimuth Paheehee mauka $301^{\circ} 31'$, Lahilahi $84^{\circ} 38'$ 5180 feet and Makaha 1st $249^{\circ} 45'$, 2207 feet; thence

8. $113^{\circ} 9'$ 408 feet down side of ridge to cross on a rock in stone wall on North edge of ditch and cane near North corner of cane. Thence

9. $256^{\circ} 26'$ 2505 feet along portion of Waianae sold by Kamehameha to Robinson and Company up side of Kamaileunu Ridge and up center

of same to a spike let into the rock at summit of ridge. From this spike the following Stations bear by true azimuth: Paheehee mauka $311^{\circ} 35'$, 10,066 feet, and Lahilahi $80^{\circ} 8'$, 7327 feet. This spike marks the Survey Station called Makaha 1st; thence

10. $224^{\circ} 50'$ 7020 feet up center of ridge along Makaha;

11. $219^{\circ} 1'$ 2949 feet up center of ridge along Makaha;

12. $209^{\circ} 36'$ 2889 feet up center of ridge along Makaha to Kawiwi peak;

13. $245^{\circ} 54' 30''$ 6380 feet up center of ridge to the West summit of Kaala; thence

14. $295^{\circ} 25'$ 6085 feet along center of ridge along Waianae-uka;

15. $347^{\circ} 10'$ 3955 feet along center of ridge along Waianae-uka; thence

16. $49^{\circ} 25'$ 6905 feet down center of ridge between Waianae Valley and Lualualei to initial point.

Area 3257 acres, more or less.

And I do hereby set apart as the Waianae Kai Forest Reserve that portion of the government land of Waianae Kai within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 7th day of September, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF WAIANAE, ISLAND OF OAHU.

LUALUALEI FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, enacted April 26, 1905, and of every other power me hereunto enabling, I GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of government land lying on the Western slope of the Waianae Mountains, on the Island of Oahu, bounded on the West by the Lualualei Homesteads, on the North and East by the lands of Waianaekai, Waianae-uka and Honouliuli, on the South by the land of Nanakuli, in the District of Waianae, Island of Oahu, Territory of Hawaii, more particu-

larly described by and on a map made in January, 1906, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 2165," and "Lualualei Forest Reserve, Oahu;" and a description accompanying the same, numbered C. S. F. 1659, which said description, now on file in the said Survey Department, is as follows:

Beginning at Government Survey Trig. Station "Kawaopuu," as shown on Government Survey Registered Map No. 2165, and running by true azimuths:

1. $259^{\circ} 24'$ 4451.0 feet to + on stone and ahu;
2. $220^{\circ} 50'$ 2260.0 feet to + on stone and ahu; near small stream;
3. $308^{\circ} 52'$ 2283.0 feet to + on solid rock and ahu, at edge of high bluff;
4. $346^{\circ} 03'$ 1464.0 feet to + on solid rock and ahu, on West slope of Ka Ilio;
5. $322^{\circ} 26'$ 1730.0 feet to + on rock and ahu, to ridge overlooking Mikilua;
6. $278^{\circ} 58'$ 654.0 feet to + on stone at base of small cliff;
7. $318^{\circ} 31'$ 2542.0 feet to + on stone in Mikilua;
8. $327^{\circ} 55'$ 1096.0 feet to + on stone and ahu, at base of small cliff;
9. $344^{\circ} 37'$ 2861.0 feet to + on stone;
10. $0^{\circ} 27'$ 1459.0 feet to + on stone and ahu;
11. $1^{\circ} 46'$ 2004.0 feet to + on stone and ahu;
12. $7^{\circ} 00'$ 1009.0 feet to + on stone and ahu;
13. $317^{\circ} 22'$ 345.0 feet to + on stone at pali;
14. $35^{\circ} 51'$ 413.0 feet along base of pali to + on rock on ridge;
15. $293^{\circ} 12'$ 830.0 feet to + on rock, and mauka of stone wall;
16. $16^{\circ} 36'$ 985.0 feet to + on large boulder in stone wall;
17. $334^{\circ} 42'$ 2210.0 feet to + on stone and ahu, at edge of high bluff;
18. $32^{\circ} 55'$ 7000.0 feet;
19. $32^{\circ} 25'$ 3745.0 feet to + on solid rock, five feet mauka of fence;
20. $357^{\circ} 57'$ 4214.0 feet up ridge to Heleakala Hill;
21. Thence along the watershed of the ridge, the following points being the boundary from Heleakala; Palikea; Pohakea Pass; Puu Kaua, elevation 3105 feet; Kamahoa, elevation 2720 feet; Napapa, elevation 2878 feet; Kolekole Pass; Kumakalii, elevation 2914 feet; to the initial point.

Area, 3743.0 acres.

EXCEPTING, however, and reserving therefrom the Kolekole Pass and the trail leading thereto across the Reserve, provided that the right of way for the same shall not exceed a width of twenty (20) feet on either side of the center of the trail.

And I do hereby set apart as the Lualualei Forest Reserve that portion of the government land of Lualualei within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 30th day of November, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HANA, ISLAND OF MAUI.

HANA FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, enacted April 26, 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve those certain pieces of government land lying on the Eastern slope of Mt. Haleakala, on the Island of Maui, bounded on the West and North by the Koolau District, on the East by a line following approximately the lower edge of the existing forest across the Hana District, on the South by the Kipahulu District, in the District of Hana, Island of Maui, Territory of Hawaii, more particularly described by and on maps made in March, 1906, by the Hawaiian Government Survey Department, which maps are now on file in the said Survey Department and marked "Registered Maps Nos. 1268 and 1750" and "Hana Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1690, which said description, now on file in the said Survey Department, is as follows:

Beginning at Puu Hinai, a hill on the boundary of Hana and Koolau districts, and the Southeast corner of the land of Ulaino, (L. C. A. 8515B to Kanehea), and running as shown on Government Survey Registered Map No. 1750;

1. In a Southeasterly direction across the lands of Makapuu (Government), West Honomalee (fee simple), East Honomalee, Kawela, Kaeleku (all government), to a point on the shoulder of the hill called Olopawa, 1000 feet Northeast of the Government Survey Trig. Station "Olopawa";

2. Thence Southeasterly across the Government lands of Honokalani, Wakiu and Kawaipapa to a point on the pali of the Kawaipapa Gulch at the Northwest corner of Grant 3154 to Kahoomakaulii;

3. Thence along the following grants: 3154 to Kahoomakaulii, 3195

to C. Kalani et al., 883 to G. P. Judd; and L. C. A. 443 to Richardson, to the Southwest corner of L. C. A. 443 to Richardson;

4. Thence Southerly across the fee simple lands of Aleamai (L. C. A. 8660 to Kukamauna no Kaleimakalii) and Haneoo (L. C. A. 8525 B to Kauwa) to the Northwest corner of Grant 2879 to John Roe;

5. Thence across said Grant to its Southwest corner;

6. Thence across Government land of Kakio to a point on the Northern boundary of Government land of Waiohonu;

7. Thence Southwesterly across Waiohonu to a point on its South boundary, where the line makes an angle;

8. Thence across Government lands of Puuiki-Papahawahawa to a point on the Northeast boundary of Muolea (L. C. A. 8452 to Keohokalole) where said boundary turns almost due east;

9. Thence across Muolea (L. C. A. 8452 to Keohokalole) to the Northwest corner of Grant 382 to E. Whittlesey;

10. Thence along mauka boundary of Grant 382 to E. Whittlesey;

11. Thence across Government land of Wailua to Northwest corner of Grant 1155 to C. A. Bouillon;

12. Thence along mauka boundary of Grant 1165 to C. A. Bouillon to said Grant's Southwest corner;

13. Thence across Government lands of Paehala and Puaaluu to the boundary between the districts of Hana and Kipahulu;

14. Thence following up said district boundary until it intersects with the boundaries of Koolau, Hamakualoa, Wailuku, Honuaula, Kahi-kinui and Kaupo districts at the large rock on the Northeast brink of the crater of Haleakala, called Paleha;

15. Thence down Hana-Koolau boundary to initial point.

Approximate area, 14,825 acres.

And I do hereby set apart as the Hana Forest Reserve those portions of the government lands known as Puaaluu, Paehala, Wailua, Waiohonu, Kakio, Wakiu, East Honomalee, Puukai-Papahawahawa, and' Hana Forest Tract (unleased part); and also any other remnants of government land not under lease, within the metes and bounds of the above described Hana Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 30th day of November, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

Notice is hereby given that CHARLES H. BAILEY, Esq., has been appointed District Fire Warden in and for that portion of the District of Kona, Island of Oahu, extending from Makapuu Point to Palolo Valley.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that W. F. SANBORN, Esq., has been appointed District Fire Warden in and for the District of Halelea, Kauai, excepting the Wainiha Valley.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that C. W. HUDSON, Esq., has been appointed District Fire Warden in and for the Wainiha Valley, District of Halelea, Island of Kauai.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that JAMES MUNRO, Esq., has been appointed District Forester and District Fire Warden in and for the Island of Molokai, excepting that portion between the lands of Pukoo and Halawa, inclusive.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that C. F. CONRADT, Esq., has been appointed District Forester for that portion of the east end of the Island of Molokai, lying between the lands of Pukoo and Halawa.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

Notice is hereby given that EDWARD BROADBENT, Esq., has been appointed District Forester for those lands in the District of Puna, Island of Kauai, controlled by the Grove Farm Plantation.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

CHANGE OF DISTRICT.

Notice is hereby given that F. WEBER, Esq., is now District Forester and District Fire Warden for that portion of the District of Puna, Island of Kauai, south of and including the land of Wailua, excepting the lands controlled by the Grove Farm Plantation.

C. S. HOLLOWAY,
Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

Notice is hereby given that C. J. AUSTIN, Esq., has been appointed District Forester for the District of Hana, Island of Maui.

C. S. HOLLOWAY,
Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

PERSONALIA.

Mr. C. J. Austin, inspector's assistant in the Division of Entomology of the Board of Agriculture and Forestry, resigned his position on November 15, 1906, to become manager of the Hawaiian American Rubber Company's plantation at Nahiku, Maui.

Mr. Austin's connection with the Territorial Bureau of Agriculture goes back a number of years. From January 1, 1901, to June 30, 1903, he held the position of gardener and was in charge of the government nursery. With the reorganization of the department by the creation of the present Board of Commissioners of Agriculture and Forestry on July 1, 1903, Mr. Austin was assigned to the Division of Entomology. As his title indicates his work since then has been primarily on the wharves, inspecting the consignments of fruits, plants and vegetables coming into the port of Honolulu.

Always an ardent believer in diversified agriculture Mr. Austin has for some time taken an active interest in rubber. He is well prepared for the work ahead of him and he goes to his new field with enthusiasm.

We have received a very interesting publication upon Sisal, and the cultivation of fibre plants generally, written by Mr. A. J. Boyd, editor of the Queensland Agricultural Journal, Brisbane. In a communication from the author, he writes, in part: "I see by the September number of the Forester that the export of Hawaiian Sisal has diminished to the extent of \$982. I had fully expected to hear that the export had doubled. I am planting as fast as I can get plants. My plantation is only two years old, but I can foresee a good cutting for next July. At St. Helena Plant Establishment here, they made two tons six hundredweight of fibre from less than one acre and it was sold f. o. b. here at £35 and £36.10 per ton. That beats any record I think."

The Forester shared Mr. Boyd's expectation of the development of Sisal exported from Hawaii. The quality of our local fibre is superb, and it would be interesting to be informed as to cause of the diminished production.

RUBBER TREES ON KAUAI.

The following details are taken from information collected by Mr. Charles S. Judd, Special Forest Agent of the Division of Agriculture and Forestry:

Koloa Grove.—Cereia trees. Three miles northeast of Koloa at the base of the ridge between Koloa and Lihue. Planted in 1895 from imported seed by Mr. Antone Cropp. The trees are set out promiscuously over five acres of ground and are intermingled with a natural forest of kukui, lauhala and ohia ai. Alligator pear, mango, orange and coffee trees are also growing among the rubber trees. Number of trees in the grove, 106. The average diameter is 6.1 inches; height 26 feet. Age of oldest 10.5 years.

Lihue Grove.—Cereia trees. Age 6.5 years. Average diameter, 6.5 inches; average height, 53 feet; number of trees, 104.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Fringe of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. KOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION.

BOARD.

- Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.
"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

- "The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

DIVISION OF FORESTRY.

- * "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.
"Instructions for Propagation and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

DIVISION OF ANIMAL INDUSTRY.

- "Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

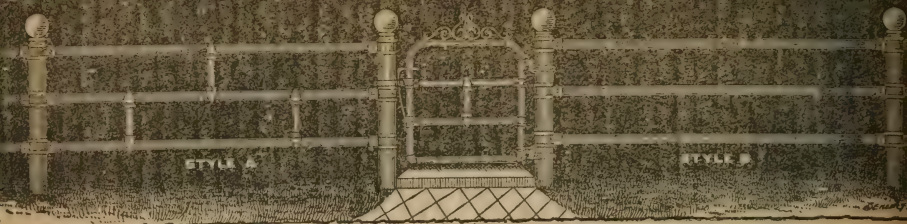
DIVISION OF AGRICULTURE.

- Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

* Out of Print.

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The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

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ISSUED UNDER THE DIRECTION OF THE
Board of Commissioners of Agriculture and Forestry

VOLUME 4—NUMBERS 1 TO 12 INCLUSIVE

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LEOPOLD G. BLACKMAM

1907

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1908

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

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No. 1

The exhibition of poultry and general agricultural produce, which took place in December under the auspices of the combined poultry and agricultural institutions of Honolulu, was among the most important events of 1906. A marked advance in the standard of excellence evidenced in the poultry over the previous year was apparent, and should be gratifying to all interested in feathered stock. An attractive feature of the undertaking, and one which we hope will be a permanent part of future poultry shows, was the inclusion of an agricultural exhibit. It is unfortunate, however, that the season which finds the birds in good plumage is as a rule deficient in good fruit. With the general exception of oranges, limes, pomelos, pineapples, breadfruit and some others the month of December is not one which can be expected to elicit a good exhibition of general fruit. The winter poultry show should, in time, become a great one to the citrus grower. The development of our citrus fruit industry is greatly to be desired and we look forward to seeing in future winter shows a marked advance in all varieties of citrus fruit.

Now that the experiment of a winter agricultural exhibition has been attempted, the experience gained has shown much that would render a summer exhibition justifiable. Given a thorough and well planned classification of exhibits, an attractive but not unnecessarily expensive prize list, and a few months' notice in order to enable growers to make proper preparations, a fruit and flower show, held under canvas in some one of our beautiful parks, would at once become one of the most popular and enjoyable features of a Honolulu summer. The benefit to be gained from a healthy rivalry among private fruit flower growers, and the experience to be gained from a public opportunity of comparison is incalculable. Indeed, it is not too much to say, that without some such stimulus, very little advance need be expected in the quality of fruit produced by the majority of private growers. And it is to be conceded that with the raising of the standard of fruit among private growers, will, at once, come a demand for better qualities of marketed fruit, so that in a short time, in order to sell fruit, it will be necessary to grow the best. Fruit and flower shows have hitherto been too few in Honolulu, and to this may very greatly be attributed the paucity and poverty of the varieties seen, not only in private yards, but in the open market. As a rule the systematic cultivation of fruit trees is neglected.

Indeed it is the exception to see, when trees have once been set out, any personal care whatever bestowed upon them by the owner. They are almost universally relegated to the attention of a yard boy, upon whose negligence or excessive zeal with the ubiquitous hose, they are solely dependent. Judicious pruning or fertilizing they have none and each crop deteriorates and becomes every year more scanty and less attractive to sight or taste. With a popular annual fruit exhibition, this undesirable condition of affairs would gradually disappear, and owners of good trees would take pride in obtaining the best results from them. Tough, thick-skinned, pithy citrus fruits would be more seldom seen and insect infested and unsightly mangoes and avocado pears would be expelled from the market. Throughout the Territory, the general standard would be raised, until in a few years our fruits, both in quality and quantity, would rival those of any tropical country in the world.

The matter is of sufficient importance to make it the object of a legislative grant. A sum of about two thousand dollars devoted to a summer agricultural exhibition would do much to bring about the condition of affairs we have alluded to. An appropriation of four or five thousand dollars would enable an exhibition, not only of horticulture and agricultural produce, but of general stock, and would attract entries from all the islands. Such an exhibition extending, with other attractions, a week in duration, and assisted by cheap round trip steamer fares would soon be made by residents of the other islands the occasion of a regular annual visit to Honolulu, and would become in time the most popular and enjoyable feature of the Honolulu summer.

In view of the fact that the Forester is the official journal of the Board of Commissioners of Agriculture and Forestry of this Territory, it seems expedient to group together the contributions issuing from the various divisions of the Board. In future therefore all such matter will appear under the general title "Board of Agriculture and Forestry" and will occur as near the beginning of each number as may be convenient. The various Divisions of the Bureau will each have the matter pertaining to it designated under its proper sub-heading. The following Divisions of the Board are in operation: Forestry, Entomology, Animal Industry and Agriculture. Of these, the latter is in coöperation with the Hawaii Experiment Station.

By the above arrangement of the contents of the Forester it is hoped to render information relative to special subjects more accessible. Technical and purely official matter, such as By Authority Notices and Forest Reserve boundaries, will, as heretofore, appear at the end of each issue.

We publish with much satisfaction in this number an extract from President Roosevelt's Message to Congress relative to agriculture and the conditions prevalent in Hawaii. It is gratifying to have such high acknowledgment of the duty of the mother country towards our islands, and to be assured that an effort will be made to assist us in the way most befitting our exigencies. When it is properly appreciated that their isolation has imposed upon the islands duties out of proportion to the size of their community, the day will not be far distant when they will receive the hearty coöperation of the nation.

Mr. Higgins' paper on the cultivation of the Roselle, to which we alluded last month, is included in this number. It will be found of especial interest to the growers of fruit, who hitherto have experienced a difficulty in obtaining that best suited for preserves. The recipes given in the article for the production of jams and jellies are very acceptable, and their use will enable the housekeeper to join to her resources a most agreeable adjunct.

Mr. J. F. Brown, who has taken an active interest in the progress of practical forestry, and has rendered efficient service in matters pertaining thereto, has relinquished his active duties as a member of the Board of Forestry. Mr. Leonard G. Kellogg has been appointed as Commissioner of Agriculture and Forestry for a term of five years to fill the office rendered vacant by Mr. Brown. Notice of this change appears in this number.

Attention is called to an interesting contribution entitled "Seed Distribution in Hawaii" that appears on another page of this issue. The author, Mr. Charles S. Judd, does not need to be introduced to the readers of this magazine. Mr. Judd is now a senior in the Yale Forest School. It will be remembered that as Special Forest Agent, under the Board of Agriculture and Forestry, Mr. Judd last summer had charge of certain forest investigations on Hawaii, during which he had opportunity to visit a number of the places mentioned in his article.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Agriculture.

THE ROSELLE.

By J. E. HIGGINS, *Horticulturist Hawaii Experiment Station.*

Among the different plants that have been experimented with at the United States Agricultural Experiment Station during the past year is the "Roselle" or "Rosella."* This

* The form "Roselle" is most in use in the West Indies and is given the preference in Bailey's Encyclopedia of American Horticulture. The form "Rosella" is common in Australia.

plant was first introduced in Hawaii from Australia, so far as the writer is informed, by Mr. R. A. Jordan. A supply of seeds was secured by the Experiment Station from Porto Rico in 1904 and the plants have been grown on a field scale for two years. It gives promise of being a very useful plant.

USES.

The fruits of this plant consist of a fleshy calyx and a seed-pod which are used in the making of jam, jelly and a cooling drink. The flavor is tart and if not obscured by the use of an excessive amount of sugar, resembles closely that of cranberries. In color and general appearance, both the jam and the jelly are very attractive. The following directions for the manufacture of jam have been used in experiments conducted by Miss Alice R. Thompson of this Station. The data will also show the quantity of jam or of jelly which can be produced from a given number of pounds of fruit. These experiments were conducted with fruit that was rather over mature and the seed-pod was too ripe to be used. When the fruits are young the whole of the fruit may be used.

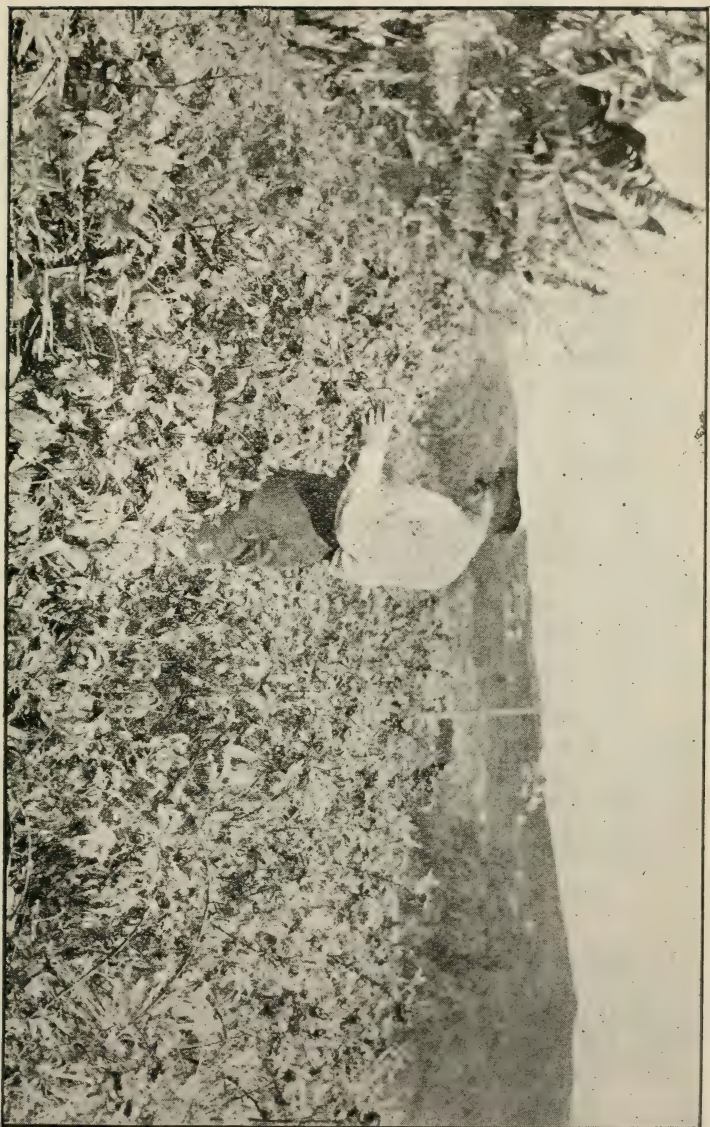
ROSELLE JAM.

Wash six pounds of Roselles, open and remove the seed-pod. The weight of the flesh will be about three pounds. Add two cups of water to the berries and cook about an hour until reduced to a soft pulp. Measure the cooked fruit and add one and one-fourth cups of sugar to each cup of fruit. Cook twenty minutes.

Six pounds of Roselles will make seven pounds of jam or eleven half-pint cups full.

ROSELLE JELLY.

Wash and seed four pounds of Roselles. The weight of the flesh will be about two pounds. Add four cups of hot water and boil to a pulp. Strain the whole through a cloth bag without pressing. Measure the juice and boil it *continuously* twenty minutes. Then add one cup of sugar for each cup of juice. The sugar should be heated in the oven before adding it to the juice, so that the boiling will not be interrupted. Cook until, on testing the consistency of the liquid by pouring from a spoon, the last drop adheres to the spoon. Remove from the fire and pour into the jars. Four pounds of Roselles will make two pounds of jelly or two half-pint cups-full.



THE ROSELLE IN CULTIVATION

It is best to plant the seeds in boxes or seed-beds about the last of February or the first of March in Honolulu and transplant to the open field when the plants have attained a height of six or eight inches. From the experience of the last two years at the Station, there appears to be nothing gained by planting seed earlier than February. Seed planted before this date has produced plants which have borne prematurely and have not produced the main crop any earlier than those from seed planted later. The plants should stand about three to four feet apart in the row and the rows from four to six feet apart. If the soil is good and moisture abundant, four by six feet will not be too great a distance.

The soil for the Roselle need not, however, be the richest, but good soil will yield correspondingly good results. The harvest comes on about November and December in Honolulu. It is quite possible that in other parts of the Islands, other seasons for planting may be found preferable and the crop may mature earlier or later.

The after cultivation will consist only in keeping the soil well tilled and supplied with moisture.

The yields per acre in the experiments conducted at the Station would average from six thousand to seven thousand pounds per acre with a very moderate use of water. The cost of picking these fruits would be from a half-cent to three-quarters of a cent a pound. At four cents per pound net to the grower, these fruits could be placed on the market at a price very much lower than cranberries. Allowing three-quarters of a cent per pound for the cost of gathering, a quarter of a cent for packing materials, there would remain three cents per pound as the value of the fruit on the plants. These at six thousand pounds per acre would represent a value of \$180.00 per acre for the crop in the field.

THE BOTANY OF THE ROSELLE.

The Roselle is known botanically as *Hibiscus sabdariffa*, and belongs to the family "*Malvaceae*." The home of this plant is thought to be in the Tropics of the Old World. It is now cultivated in many parts of the Tropics.

THE MANGOSTEEN.

While at press, we have received, too late for publication, a communication from Mr. Gerrit P. Wilder, relative to a Mangosteen tree growing at Lihue. Mr. Wilder's letter will appear in the February issue.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

GOVERNMENT WASTE LAND.

At a meeting of the Board of Agriculture and Forestry, held on December 21, 1906, there was passed a resolution, based on reports submitted by the Superintendent for Forestry and by the Committee on Forestry, that further defines the policy of the Board in regard to the disposition of waste land belonging to the Territorial Government.

Another report on the land of Kaohe, similar in tenor and purport to those given below, was approved by the Board in December, 1904, and appeared in this magazine in the issue of May, 1905, Vol. II, pp. 124-127.

Following are the resolution and reports first mentioned:

RESOLUTION IN REGARD TO THE LAND OF KAOHE, HAMAKUA, HAWAII.

(Adopted by the Board of Agriculture and Forestry on December 21, 1906.)

Resolved, that the Board of Commissioners of Agriculture and Forestry approves the recommendation of the Committee on Forestry in regard to the retention by the Government from sale or lease of the mauka part of the land of Kaohe, District of Hamakua, Island of Hawaii, contained in a report dated Nov. 1st, 1906, based on a report of the Superintendent of Forestry dated Oct. 13th, 1906.

Resolved, that the Board recommends to the Governor that the portion of Kaohe lying above a line roughly described as beginning on the boundary between Kaohe 4 and 5 at the end of the mauka fence required to be built across Kaohe 4 by a lease sold to Mr. A. M. Brown in December, 1904, and running in a general northwesterly direction, mauka of Puu Ahumoa to Puu Laau, thence northeasterly along the mauka boundary of Paauhau to Puu Kemole, thence mauka of Puu Kaluamakani to a point on the division line between Kaohe 3 and Kaohe 5, thence along said division line to the northwest end of the existing fence across Kaohe 5, built by the Kukaiau Plantation Company, thence in a general southeasterly direction across Kaohe 5, following said fence, to the Humuula boundary, thence following said Humuula boundary to the south and west around Mauna Kea to the southeast line of Kaohe 4, thence across Kaohe 4, following the above described fence to the point of beginning, and also the portion of the land of Kaohe that lies above the Keamuku and the 1843 lava flows on the north slope of Mauna Loa, be for the present reserved by the Government from sale or lease and retained by the Land Office as waste land.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Nov. 1, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen:—Your Committee has had under consideration the report of the Superintendent of Forestry, dated Oct. 13th, 1906, concerning the land of Kaohe, District of Hamakua, Island of Hawaii.

The upper portion of the said land should, in the judgment of your Committee, be classed as waste land, being unsuited for any economic use now known.

But in order that it may be available in future when it is possible that some use may be found for it, your Committee are in favor of its retention from sale or lease by the Government.

Your Committee therefore recommend that the Board approve the suggestions of the Superintendent of Forestry and that a recommendation embodying them be adopted by the Board and transmitted to the Governor and to the Commissioner of Public Lands.

We remain,

Your obedient servants,

Very respectfully,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Oct. 13, 1906.

Committee on Forestry,

Board of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have to submit the following report upon the land of Kaohe, District of Hamakua, Island and County of Hawaii, with the recommendation that certain portions of this tract be reserved from sale or lease, as waste land.

Kaohe is the largest single land in the Territory, its area being given in the last Land Office List as 218,257 acres. It includes practically all of the upper slopes of Mauna Kea and a good share of the northern slope of Mauna Loa. For purposes of classification in the Land Office, Kaohe is divided into six parts. Kaohe 1 is cane land under a five-year lease, expiring in 1909. Kaohe 6 is open grazing land not under lease. All of the remainder of Kaohe consists of grazing, open forest and waste land. A portion of Kaohe 2 (1,035.6 acres) is under lease until January 10, 1909. The lease on the remainder of Kaohe 2, with those on Kaohe 3, 4 and 5 expired on September 9, 1906, but a new 21-year lease

for a portion of Kaohe 4 went into effect the next day. This lease was sold to Mr. A. M. Brown during the winter of 1904.

Kaohe 2 and the lower portion of the other three tracts are primarily of value for grazing and should in my judgment be so used, except as hereinafter noted. Above an elevation of about 5,000 feet there is a fairly dense growth of Mamani (*Sophora chrysophylla*) making a practically pure stand, which extends up the mountain to an elevation of about 8,000 feet. Within the last ten years the belt of Mamani has, through natural reproduction, been extended both up and down the mountain and the process is still going on. Just why the Mamani should have taken this sudden start is not clearly understood, the usually excepted theory being that prior to about 10 years ago some insect or other pest held the reproduction in check. Unless a paddock is heavily overstocked cattle do not interfere with the growth or reproduction of Mamani. In fact over a considerable part of the Mamani belt the trees are coming up so thickly as almost to preclude grazing. Obviously no artificial protection is required for this type of forest.

The Mamani forest extends some distance above the area of good grazing land, which is marked by the upper limit of the valuable native and introduced grasses. The section above the Mamani belt being without valuable vegetation is of little account for grazing. It is for the most part now used only by wild cattle and horses. There seems at present no economic use to which it can be put.

In the leases that have just expired this area of waste land was included with the good land below, thrown in as it were as a sort of "manuahi," thereby greatly swelling the acreage under lease, but being of little value to the lessee. In my opinion this arrangement serves no good end and should in future be discontinued; the land of value for grazing being leased as such and the remainder held by the Government as waste land.

In a report upon the land of Kaohe 4 made to the Board under the date of Dec. 3rd, 1904, I made similar recommendations in regard to the mauka part of that tract. These were adopted and when the lease was made to Mr. Brown only the good grazing land was included, thus establishing a precedent in regard to waste land. I now recommend that when Kaohe 3 and 5 are re-leased the portion above the following roughly described line be excluded and retained by the Land Office as waste land:

Beginning on the boundary between Kaohe 4 and 5 at the end of the fence required to be built across Kaohe 4, the line should run mauka of Puu Ahuamoa to Puu Laau, thence along the mauka boundary of Paauhau to Puu Kemole, thence mauka of Puu Kaluamakani to a point on the division line between Kaohe 3 and Kaohe 5, thence along said division line to

the northwest end of the existing fence across Kaohe 5, built by the Kukaiau Plantation Company, thence across Kaohe 5 following said fence to the Humuula boundary, thence following said Humuula boundary to the south and west around Mauna Kea to the southeast end of the fence required to be built across Kaohe 4 and along the same to the initial point.

Mr. A. W. Carter, representing the Parker Ranch, has proposed to lease the grazing land in Kaohe 3, with a proviso in the lease that a fence be built and maintained across Kaohe 3 following the line just described. Across Kaohe 5 a fence built sometime ago by the Kukaiau Plantation Company (the one mentioned in the above description) marks the division between the good grazing and the waste land.

With the building of the fences on Kaohe 3 and 4 and the gradual capture of the wild cattle on the mountain, facilitated thereby, stock will be kept off this upper section.

The retention by the Land Office of this area of waste land is directly in line with the policy of the administration to put the government land to its best use and furthermore it leaves what is now an unavailable tract in such shape that if a use is found for it in later years it will then be available for lease or sale. With the introduction of new grasses it is quite possible that the area of good grazing land may in time be extended mauka, while there seems to me no good reason why much of the area on the sides of Mauna Kea, between the elevation of 8,000 and 10,000 feet could not be made to grow forest trees from the temperate zones, such as Pines, Firs and Spruces, that in time could be looked to to supply construction timber. The establishment of such a forest belt would, of course, entail a considerable expense, even though the method of scattered seed spots were adopted, but experiments have been begun to determine what species are best adapted for use in this locality. Funds for more extended work are not now in sight.

Kaohe 2.

On the part of Kaohe 2, between the mountain road and the upper line of the upper Pohakea homesteads, the forest has been destroyed by one cause and another, the chief among them being fire, until with the exception of a few groves of Koa and a section of the Mamani belt, practically the whole area is open country which could only be reforested by artificial means. Except for the Koa groves already mentioned there are not enough trees left to furnish seed, even were the other factors governing natural reproduction favorable, which is distinctly not the case.

Realizing the importance of the protection which an open

forest affords stock the Kukaiau Plantation has proposed to Mr. Pratt that he put up Kaohe 2 for lease with the requirement that a certain part of the land be planted with Blue gum (*Eucalyptus globulus*) trees; the stock to be kept out until the trees grow large enough to care for themselves. I heartily approve of this plan and am now having prepared by Mr. Haughs a planting plan under which the work could be done.

If natural reproduction of Blue gum takes place in Hamakua as it has in certain other upland districts of the Territory this section may in time come under a forest cover of this Eucalypt.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

CHANGE OF FOREST RESERVE BOUNDARY.

Significant action was taken by the Board of Agriculture and Forestry on December 21, 1906, when a resolution was adopted approving the recommendation of the Superintendent of Forestry that the location of the boundary of the Halelea Forest Reserve be modified to exclude certain land that it had been found could be used for agriculture. This is the first case to come up under the law passed at the last session of the Legislature (Act 65 of 1905) that permits the Governor to withdraw land from forest reserves. A surveyor is now on the ground. When his work is completed a further report, with recommendations will be submitted to the Board by the Superintendent of Forestry.

Following are the reports and resolution above mentioned:

RESOLUTION IN REGARD TO A PROPOSED CHANGE IN THE BOUNDARY OF THE HALELEA FOREST RESERVE, ISLAND OF KAUAI.

(Adopted by the Board of Agriculture and Forestry on
December 21, 1906.)

Resolved, that the Board of Commissioners of Agriculture and Forestry approves the recommendation of the Committee on Forestry in a report dated November 1st, 1906, based on a report of the Superintendent of Forestry, dated October 15th, 1906, that the makai boundary line of the Halelea Forest Reserve be relocated with the idea of excluding from the reserve certain areas which it is believed can be used for diversified industries more advantageously than for forest.

Resolved, that the Board approve as defining its policy on the subject so brought up, the statement, that when it becomes possible through changed conditions of market, transportation,

etc., to develop in a legitimate and profitable way, without detriment to the main object of a given forest reserve, potentially agricultural land that may have been included in that reserve, the Board does not oppose the modifying of the reserve boundaries, upon demand, as provided by law.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Nov. 1, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the report of the Superintendent of Forestry, dated Oct. 15th, 1906, concerning a proposed modification of the Halelea Forest Reserve, in the District of Halelea, Island of Kauai.

In his report the Superintendent of Forestry points out that because of the development of the rubber industry in the Islands it has become possible to use a portion of the area now included in the reserve for a rubber plantation, and that this can be done without interfering with the value of the reserve as a whole. He accordingly recommends that the reserve boundary be so modified as to exclude the section in question.

This is the first case to come up under Act 65 of the Laws of 1905, which provides for altering the boundaries and area of existing forest reserves. Action taken in these premises will therefore in a measure establish a precedent.

Your Committee have carefully considered the question and while reserving an expression of opinion upon the relocation of the boundary until more data are in hand, do hereby approve the general position taken by the Superintendent of Forestry.

To this end your Committee recommend that the Board approve, as defining its policy on this point, the statement that when it becomes possible through changed conditions of market transportation, etc., to develop in a legitimate and profitable way, without detriment to the main object of a given forest reserve, potentially agricultural land that may have been included in that reserve, the Board is in favor of modifying the reserve boundaries upon demand, as provided by law.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Oct. 15, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report upon a proposed modification of the makai boundary line of the Halelea Forest Reserve, in the District of Halelea, Island and County of Kauai:

Following an application from Mr. W. E. Rowell of this city to purchase from the Government, with adjoining government lands, a portion of the land of Waioli within the reserve—on which it is proposed to grow rubber—Mr. J. W. Pratt requested me to re-examine the reserve boundary and make a report containing my conclusions in regard to a modification of the location of the line. Accordingly I arranged to visit Hanalei during my recent trip to Kauai, and on September 22, 1906, went over the ground in question in company with Mr. Rowell and Mr. F. E. Harvey of the Survey Office, we three having met at Lihue by appointment the day before.

The main object of the Halelea Forest Reserve is the protection of the forest cover on the Halelea watershed against the time when the streams may be turned to account for the production of power or for irrigation. The makai line of the reserve as originally laid out was intended to, and at that time did, clear all the land which was believed to be suitable for agriculture or grazing or which it was thought could be profitably used in this way for many years. But recent developments in the rubber industry have made it appear that certain protected gulches, now under forest, just within the reserve boundary, might profitably be used for growing rubber. It is Mr. Rowell's intention to organize a stock company for this purpose and because of the obstacles that the five-year-agricultural-land clause place in the way of a new industry, to acquire the tract by purchase. Mr. Rowell also contemplates leasing the similarly situated area on the Bishop Estate lands of Waipa and Lumahai. As the same conditions obtain on these lands as on Waioli the examination was made to include them as well.

The question before me in this examination was whether or not a relocation of the forest line, cutting out the area desired, could be made without detriment to the objects for which the reserve as a whole stands.

The present line takes in portions of the wooded area at the upper end of the gentle slope at the foot of the main pali and also a few small wooded gulches on the sides of two or three of the more prominent lateral ridges. As surveyed it runs

between conspicuous points on the ridges; the idea being, in common with other forest reserve lines, that if it should become necessary to fence the boundary, the fence would be built on the best natural lines between these points. To exclude the land desired by Mr. Rowell would push the boundary back and make it run directly at the base of the main pali, leaving outside all the gently sloping area. Neither the total area nor the area on any one land excluded from the reserve can be told exactly at this time, but the total area for the three lands would probably be something less than one thousand acres.

As the important streams head high up in the mountains and are only affected in a slight degree if at all by the strip in question, its retention in the reserve is not a matter of great importance. It was included in the first place because being unavailable for agriculture and under forest it appeared to belong with the reserve rather than with the lower land.

From my previous study of the general situation, with the additional acquaintance with the district gained by looking at the problem from this new point of view, I believe that the reserve boundary can be modified without detriment to the value of the reserve as a whole, especially as the portion proposed to be excluded would still remain at least in part under a cover of trees.

For this reason I recommend that the makai line of the Halelea Forest Reserve be so relocated as to exclude the area desired by Mr. Rowell.

In connection with the work at Hanalei Mr. Harvey is soon to locate the points on the proposed line. When his description is at hand I shall transmit a copy of it to this Committee, with the further recommendation that it be adopted as the official line, after a public hearing held under the terms of Chapter 28 of the Revised Laws as amended by Act 65 of the Session Laws of 1905.

The present recommendation is made with the full understanding that if followed it will tend to establish a precedent for future action, although by no means one which must necessarily be followed in all cases, for in forest reserve matters each case is decided on its own merits. It is made advisedly as another link in the chain of forest policy that is gradually being forged for this Territory. For when it becomes possible without detriment to the main object of a given forest reserve, to develop in a legitimate and profitable way potentially agricultural land that may have been included within its boundaries, I believe it is not only good policy but good sense to do so.

In conclusion I recommend that a copy of this report be sent to Mr. J. W. Pratt for his information.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

POULTRY AND AGRICULTURAL EXHIBITION.

SECOND ANNUAL EXHIBIT OF THE HAWAIIAN POULTRY ASSOCIATION
IN COÖPERATION WITH THE FARMERS' INSTITUTE OF HAWAII.

The exhibition of combined poultry and agricultural products which took place in the latter part of December was, for the agriculturist, among the most pleasant and valuable recollections of the year that has just closed. A general desire had been evidenced at the first exhibition of the Poultry Association in 1905, to extend the range of its exhibits in order to appeal to a wider circle of patrons, and the suggestion of including agricultural commodities at future exhibitions elicited encouraging evidences of success. The scope of the second annual poultry exhibit was therefore enlarged and the coöperation of various societies and institutions enlisted to undertake its organization. Of these the Farmers' Institute of Hawaii, the Board of Agriculture and Forestry and the Hawaii Experiment Station rendered efficient help, and together with the exertions of many private agriculturists rendered the affair a most gratifying success.

I. POULTRY EXHIBIT.

The opening of the exhibition found every bird in place and the awards all posted. The number of individual exhibitors was but slightly under last year's total. The number of birds entered and shown in the poultry classes was somewhat in excess of the previous year's show, and the quality was of a higher average. The large hall and ample provision of new and attractive coops added much to the appearance of the exhibition.

The judging was by the comparison system, and was capably conducted by Judge B. M. Woodhull of Stockton, California. His decisions were accepted with satisfaction; and his readiness to explain to exhibitors the defects or disqualifications of their birds made for him many additional friends.

The prizes awarded included silver cups, merchandise in great variety, generously offered by the merchants, and cash prizes by the Association. The latter item will figure more conspicuously in

future exhibitions, now that the Association is equipped with permanent coops.

The poultry classes were well represented, some of them being large and the competition strong; while others were in some instances only sufficient in number to represent the breed.

In the American class the Barred Plymouth Rocks were again in the lead, 73 birds being shown, some of which were grand specimens. The White Plymouth Rocks were fewer, but equally fine. In Wyandottes, the Silver Laced, White, Buff and Columbian were shown, the latter being seen here for the first time and attracting much attention by their close resemblance to the Light Brahma. A choice pen of Rosecomb Rhode Island Reds were sent from Hawaii.

The Asiatic class showed Light and Dark Brahmas, Buff and Partridge Cochins, and Black Langshans, all of good quality.

The Mediterranean class was fairly represented in White Leghorns, the Brown and Buff varieties being few. Minorcas were well represented in both the Black and White varieties, the latter being shown here for the first time. The Blue Andalusian was also represented.

In the English class, the Dorkings and the Buff and Black Orpingtons were very attractive.

The Game class although small was good, and but few specimens of Bantams were exhibited.

In Ducks, the Pekin led with several fine specimens. There were also White and Colored Muscovies, and Indian Runner, the latter having been sent from Hawaii. But one exhibit of Geese was made, a pen of Toulouse. White, Bronze and Black Turkeys were also shown. Capons were notably few. The egg display was small, though attractive.

The Pigeon classes were fairly represented by birds of rare good quality. Here there was a great falling off in entries and number of exhibits.

A notable incident of the show was the disqualification of the best Barred Plymouth Rock cock through his misfortune of being entered in a pen containing a hen with a disqualifying defect.

A general tendency to underweight was noticeable in most classes. As will be seen "general purpose" breeds, constituting the American class, greatly outnumbered other exhibits.

II. AGRICULTURAL EXHIBIT.

The agricultural department of the exhibition naturally falls under four heads, the displays of the Board of Agriculture and Forestry, the Hawaii Experiment Station, the general competitive exhibition and private collections not entered for competition.

BOARD OF AGRICULTURE.

The display of the Board of Agriculture and Forestry was arranged in order to represent the development of Forestry in Hawaii. For this purpose large maps were exhibited to display in graphic form the areas at present under the beneficial control of the Board's supervision, and such tracts whose inclusion as forest reserve is now contemplated.

A most instructive series of young growing trees at various stages of growth was also shown, to represent methods of propagation as adopted by the King Street Nursery. An examination of these afforded to the novice a lesson in practical tree cultivation, in a manner which would be the most readily retained and put into practice. Samples were also shown of the banana leaf pots adopted by the nursery for small plants. By the use of these pots the roots are not disturbed in transplanting as the whole pot and its contents are planted together.

The present development of interest in the cultivation of rubber also received attention, and specimens of all the species likely to become of economic importance in the islands were shown. Besides these a good display of general palms and foliage plants was arranged and also a collection of the literature of the Board for general distribution among visitors.

HAWAII EXPERIMENT STATION.

The exhibition of the Hawaiian Agricultural Experiment Station was devoted in the main to a representation of the various industries of the Territory. Of these probably the most important of those shown was that devoted to tobacco. The cultivation of this plant is the youngest of the many new crops which have of late been made the subject of experiment in the islands, and together with that of rubber is anticipated to extend largely in the future and to hold a prominent place in our agricultural resources. Samples of Hawaiian grown wrapper, binder and filler tobaccos were shown and also specimens of cigars manufactured from Hawaiian tobacco. This exhibit attracted much attention and was considered one of the chief features of the Station's display.

Excellent work is being done by the Hawaii Experiment Station in the development of a new rice, suited to our peculiar requirements. Six specimens of promising new rices were shown by Mr. F. G. Krauss, who is in charge of the investigation which is being conducted. These were selected from one hundred varieties which were grown in a comparative test in the fall of 1906. Series of rice plants, illustrating extreme types and varieties, and plants grown from selected and

ordinary stock were also shown, together with illustrations of the progress of the experimental investigations

Samples of the different grades of coffee of the principal coffee growing countries of the world afforded an excellent opportunity for comparison of which many growers availed themselves.

One of the most important of our smaller industries is the production of honey. The display of this product was exceedingly attractive. A series of fifty samples of Hawaiian honey of different colors, honey in the comb, and bees-wax in glass jars and in cases for shipment were shown. An observatory hive of the newly introduced Cyprio-Carniolan race was also a feature. This new bee gives promise of equalling or even excelling the qualities of the best Italian bees at present in Hawaii.

The cultivation of silk was represented by cocoons, by raw and waste silk. That shown was grown at the Experiment Station. It is of fine quality and demonstrates that the islands can produce excellent silk which affords promising economic results in the reeling. Samples of silk produced on Kauai by Messrs. Ladd & Co. in 1842 were also displayed.

The shipments of fruit from the islands is increasing very rapidly. This feature of Hawaiian export trade has received special attention from the Experiment Station which recently dispatched Mr. Higgins to the Coast in order to ascertain the most advantageous methods of packing Hawaiian fruit. At the exhibition various wooden crates which have been successfully employed for this purpose were shown, ready packed with fruit for shipment. The fruit neatly wrapped in paper and protected with corrugated strawboard, looked very attractive. The crates exhibited were primarily intended for avocado pears and papaias, various sizes of each of which were shown.

In coöperation with the Territorial Board of Health, the Experiment Station presented the work which is now in progress for the control of mosquitoes. An aquarium of the imported top-minnows, or mosquito-eating fish, attracted much interest. Aquaria containing developing mosquito larvae afforded excellent object lessons of the danger of allowing standing water. From these the mosquito fish were fed and the wonderful work of these voracious little creatures appreciated. Figures explanatory of the life-cycle of the mosquito were shown and also photographs, illustrations and posters illustrating the work of control.

Exhibits of the principal injurious insects of the Territory were presented in conjunction with the various insecticide remedies most effectual to check them. Series of fruit and plant

scale insects in connection with their food plants also afforded an instructive lesson.

AGRICULTURAL COMPETITIVE EXHIBITS.

The number of specimens shown in this department were disappointingly few. It is safe to say that in addition to the unfavorable season of the year, this condition was due to the fact that the initiation of an agricultural exhibition left many possible exhibitors in doubt as to the standard of quality expected. Another year will, without doubt, remedy this and many fruit growers will be encouraged to send specimens, who this year for one reason and another held aloof.

The judges of the agricultural exhibition were Dr. Wm. T. Brigham and Messrs. Gerrit P. Wilder and J. E. Higgins.

EXHIBITS AND PRIZES.

Class 1.—Decorative Plants (Potted): Palm ferns, caladiums, etc. First prize, \$5.00. H. J. Rhodes.

Class 2.—Flowering Plants (Potted): Orchids, chrysanthemums, etc. Two prizes offered. No entry.

Class 3.—Cut Flowers: Roses, carnations, lilies, etc. Two prizes offered. No entry.

Class 4.—Fruits: Oranges, lemons, limes, pomelos, grapes, mangoes, guavas, star apples, pomegranates, figs, papaias, strawberries, tamarinds, avocados, loquats, pineapples, bananas, grenadillas, breadfruit, mangosteen, etc. First prize, \$5.00; Lunailo Home. Second prize; no award.

Class 5.—Oranges. Fourteen entries. First prize, \$1.00; Dorothea Krauss. Second prize, red ribbon; Judge W. F. Frear.

Class 6.—Lemons. No entries.

Class 7.—Limes. Two entries. First prize, \$1.00; Lunailo Home.

Class 8.—Pomelos. Four entries. First prize, \$1.00; W. E. Hall, Honolulu. Second prize, red ribbon; Byron O. Clark.

Class 9.—Grapes. No entry.

Class 10.—Figs. No entry.

Class 11.—Papaia. No entry.

Class 12.—Pineapples. One entry. First prize, \$1.00; Haiku Fruit Packing Co. Second prize, red ribbon; Haiku Fruit Packing Co.

Class 13.—Strawberries. Two entries. First prize, \$1.00; Byron O. Clark.

Class 14.—Bananas. One entry. No award.

Class 15.—Grasses and Fodder Plants. Three entries. First

prize for largest and best collection, \$2.50; Moanalua Dairy.

Class 16.—Miscellaneous: Honey, silk, etc.

In each of the above classes two prizes were offered. In class 12, the Wahiawa Consolidated Pineapple Company sent in a splendid lot of fruit too late for competition.

SPECIAL PRIZES.

First prize, Blue Ribbon; second prize, Red Ribbon.

Taro. One entry. First prize, Judge W. F. Frear.

Pomegranates. Three entries. First prize, Judge S. B. Dole; second prize, Judge S. B. Dole.

Yellow Sapota. One entry. First prize, E. W. Jordan.

Bread Fruit. One entry. First prize, Judge S. B. Dole.

Wi. Four entries. First prize, W. M. Giffard.

Mangoes. One entry. First prize, Mrs. W. L. Bowers.

Avocadoes. One entry. First prize, Byron O. Clark.

Mandarin Oranges. Four entries. First prize, W. C. Weedon.

Carambola. Nine entries. First prize, Mrs. T. E. King.

The general quality of the above fruits was very commendatory. Of these Judge Dole's bread fruit and pomegranates, Mr. Weedon's Mandarin oranges and Mr. W. M. Giffard's Wi fruits were particularly fine. The exhibition of Mangoes and Avocadoes were noteworthy as being cultivated at this season of the year. Among the more unusual fruits the Yellow Sapota attracted much attention and was generally admired. The number of Carambolas shown was somewhat unexpected, although there were some growers of this handsome fruit who were not represented.

EXHIBITS NOT COMPETITIVE.

The exhibition was indebted to Mr. Gerrit P. Wilder for a most excellent series of plaster casts of mango fruit. These ranged in size and coloring to a wonderful extent and formed a very pretty and attractive series. Mr. Wilder has been for many years one of our foremost pomologists and has done much, not only to introduce new species of fruit to Hawaii, but also in the development of improved varieties of mangoes.

A magnificent exhibition of potted palms and plants was displayed by Mr. S. M. Damon, Moanalua, through Mr. McIntyre. These added a particularly attractive feature to the show.

SEED DISTRIBUTION IN HAWAII.

BY CHARLES S. JUDD.

In the study of seed distribution it may be interesting to note a few phases of that phenomenon in Hawaii and to cite a few examples.

Seeds may be distributed in many different ways, but perhaps the most profound method is by ocean currents. It was the carrying of sea beans by ocean currents to the Orkney Islands, north of Scotland, that suggested to Hans Sloane as early as 1693 the existence of the current which was afterwards known as the Gulf Stream. These beans were recognized by him as the seeds of plants he had seen in his botanical investigations in Jamaica. On our own shores any day these beans may be picked up, but they have been simply washed down from the interior of the islands by the streams and carried along the beaches by the tides and shore currents. In the same manner, the fruit of the Milo (*Thespesia populnea*) which possesses cavities filled with air and consequently floats well, may be seen along the beaches, often germinating in the sand. Also, the round nuts of the Kamani (*Calophyllum inophyllum*) and the almond-shaped fruits of the *Terminalia catappa*, also called "Kamani." On the beach at Hanalei, after a storm, thousands of young Ironwood trees come up, the seeds being washed along the sands. Safford says that on the island of Guam "hundreds of these (ironwood) seeds, together with the queer-shaped Barringtonia fruits, are always to be found germinating on the stretches of sandy beach along the southern portion of the east coast of the island."

While seeds may be carried along our shores by the tides and shore currents it is improbable that we can ascribe much credit to ocean currents for bringing us the seeds of our useful plants, on account of the isolation of our islands and the adverse direction of these currents. One thing the currents of the ocean do bring us and that is the huge logs and stumps from Oregon and Washington which the natives constantly discover on our shores and find so useful.

In another manner water has an influence in seed distribution. Look up the side valleys of any of our larger valleys back of Honolulu and note whether the light foliage of the Kukui is most prominent, on the ridges or in the valleys. The fruit, falling from the tree partly rolls down the slopes, but for the most part is washed into the valley-bottoms, there to germinate. In the ironwood grove of the Lihue Plantation, just above the famous "hollow tree," there exists a young stand of Kukui so thick that a person cannot force his way through them. The nuts were washed down the valley in large quantities, there to germinate and form a dense stand.

The wind is another very important and useful agent in seed dissemination. In fact some of the silvicultural systems in European and American forestry depend upon this natural agent in the re-stocking of the stands of light-seeded trees. For example, the light seed of the Tulip tree in the Alleghany Mountains is known to have been carried by the wind for a distance of a mile. It is fortunate indeed, that two of our most widely planted economic trees, the Ironwood and Silk Oak, possess light, winged seeds which can be carried to some distance by the wind. Safford states that the seeds of the Ironwood are so light that "when a handful of them is thrown into the air, they resemble a swarm of flying insects." At Papalinaloa, on Kauai, young Ironwood seedlings continually come up in the sandy soil over 300 feet distant from the parent trees, the seeds being carried there by the wind. This property of the seed, of being carried by the wind, will greatly aid in the distribution of these two species and will make their spread more rapid.

Birds, also, are in many cases responsible for the distribution of many heavy-seeded plants. In the southern States of New England it is an accepted fact that the spread of the Red Cedar on the abandoned pastures is due to the birds who carry and drop the seeds there. We have only to look upon our own hills to see how the Lantana has been scattered widespread over the land by the turtle-dove. This plant was unfortunately introduced in 1858 and has been carried far and wide by birds, which feed on the aromatic berries, not only over the pasture lands, ruining them, but even up to pockets on the cliffs where not even the nimble goats may climb. About the most useful example of seed distribution by birds is found at Lihue, Kauai, and, I doubt not, in many other parts of the islands. Here the fruit of the Java plum is picked by mynah birds for its juicy pulp and the seeds are thus carried over the country and dropped, especially in the vicinity of Huleia Guich. It is found coming up not only through Lantana thickets and on rich soil, but also on the dry- barren ridges where nothing else will grow. The tree is useful for fuel but in growing on these barren places it will serve the much more useful purpose of acting as a ground cover in hindering run-off and preventing the further erosion of the soil.

Seed distribution by animals possesses the best example in the extensive occurrence of the Algaroba tree in the Hawaiian Islands. Introduced as a small slip in 1837 by Father Bachelot it has spread most wonderfully over large areas, so sterile as to support no other tree growth. It now furnishes fuel for the use of man, fodder for cattle and horses, and honey for bees. This widespread and rapid distribution of Algaroba is due entirely to horses and cattle. When the pods are eaten, the small, horny seeds are not only not injured by the animals but, on the contrary, are even prepared for quick germination by the action of the digestive

fluids. This fact was made use of by Mr. W. H. Rice in establishing a grove of Algaroba trees at Kipukai, Kauai. This gentleman had repeatedly planted this species there with no success, and so resorted to the following expedient: He fed a drove of mules with Algaroba pods and then sent them over the mountains to Kipukai and turned them loose on the land. The result was the establishment of a full stand of trees. In seven years he has thus secured a dense grove of about 15 acres, which not only supplies shade and fodder for his animals, but also fuel for his men who formerly had to depend upon driftwood.

PRESIDENT ROOSEVELT'S MESSAGE TO CONGRESS.

THE PROGRESS OF AGRICULTURE.

The recent message of the President to Congress contains much that is important in relation to the agricultural condition in Hawaii. The following paragraphs are of particular interest to our readers:

The only other persons whose welfare is as vital to the welfare of the whole country as is the welfare of the wageworkers, are the tillers of the soil, the farmers. It is a mere truism to say that no growth of cities, no growth of wealth, no industrial development can atone for any falling off in the character and standing of the farming population. During the last few decades this fact has been recognized with ever-increasing clearness. There is no longer any failure to realize that farming, at least in certain branches, must become a technical and scientific profession. This means that there must be open to farmers the chance for technical and scientific training, not theoretical merely, but of the most severely practical type. The farmer represents a peculiarly high type of American citizenship, and he must have the same chance to rise and develop as other American citizens have. Moreover, it is exactly as true of the farmer as it is of the business man and the wageworker, that the ultimate success of the nation of which he forms a part must be founded, not alone on material prosperity, but upon high moral, mental and physical development. This education of the farmer—self-education by preference, but also education from the outside, as with all other men—is peculiarly necessary here in the United States, where the frontier conditions even in the newest States have now nearly vanished, where there must be a substitution of a more intensive system of cultivation for the old, wasteful farm management, and where there must be a better business organization among the farmers themselves.

ORGANIZATION IS NECESSARY.

Several factors must coöperate in the improvement of the farmer's condition. He must have the chance to be educated in the widest possible sense—in the sense which keeps ever in view the intimate relationship between the theory of education and the facts of life. In all education we should widen our aims. It is a good thing to produce a certain number of trained scholars and students; but the education superintended by the State must seek rather to produce a hundred good citizens than merely one scholar, and it must be turned now and then from the class book to the study of the great book of nature itself. This is especially true of the farmer, as has been pointed out again and again by all observers most competent to pass practical judgment on the problems of our country life. All students now realize that education must seek to train the executive powers of young people and to confer more real significance upon the phrase "dignity of labor," and to prepare the pupils so that in addition to each developing in the highest degree his individual capacity for work they may together help create a right public opinion, and show in many ways social and coöperative spirit. Organization has become necessary in the business world, and it has accomplished much for good in the world of labor. It is no less necessary for farmers. Such a movement as the grange movement is good in itself and is capable of a well-nigh infinite further extension for good, so long as it is kept to its own legitimate business. The benefits to be derived by the association of farmers for mutual advantage are partly economic and partly sociological.

THE GOVERNMENT CAN HELP.

Moreover, while in the long run voluntary effort will prove more efficacious than Government assistance, while the farmers must primarily do most for themselves, yet the Government can also do much. The Department of Agriculture has broken new ground in many directions, and year by year it finds how it can improve its methods and develop fresh usefulness. Its constant effort is to give the governmental assistance in the most effective way; that is, through associations of farmers rather than to or through individual farmers. It is also striving to coördinate its work with the agricultural departments of the several States, and so far as its own work is educational, to coördinate it with the work of other educational authorities. Agricultural education is necessarily based upon general education, but our agricultural educational institutions are wisely specializing themselves, making their courses relate to the actual teaching of the agricultural and kindred sciences to young country people or young city people who wish to live in the country.

Great progress has already been made among farmers by the creation of farmers' institutes, of dairy associations, of breeders' associations, horticultural associations and the like. A striking example of how the Government and the farmers can coöperate is shown in connection with the menace offered to the cotton growers of the Southern States by the advance of the boll weevil. The Department is doing all it can to organize the farmers in the threatened districts, just as it has been doing all it can to organize them in aid of its work to eradicate the cattle fever tick in the South. The Department can and will coöperate with all such associations, and it must have their help if its own work is to be done in the most efficient style.

IRRIGATION AND FOREST PRESERVATION.

Much is now being done for the States of the Rocky Mountains and Great Plains through the development of the national policy of irrigation and forest preservation; no Government policy for the betterment of our internal conditions has been more fruitful of good than this. The forests of the White Mountains and Southern Appalachian regions should also be preserved; and they cannot be unless the people of the States in which they lie, through their representatives in the Congress, secure vigorous action by the National Government.

HAWAII.

The needs of Hawaii are peculiar; every aid should be given the islands; and our efforts should be unceasing to develop them along the lines of a community of small freeholders, not of great planters with coolie-tilled estates. Situated as this Territory is, in the middle of the Pacific, there are duties imposed upon this small community which do not fall in like degree or manner upon any other American community. This warrants our treating it differently from the way in which we treat Territories contiguous to or surrounded by sister Territories or other States, and justifies the setting aside of a portion of our revenues to be expended for educational and internal improvements therein. Hawaii is now making an effort to secure immigration fit in the end to assume the duties and burdens of full American citizenship, and whenever the leaders in the various industries of those islands finally adopt our ideals and heartily join our administration in endeavoring to develop a middle class of substantial citizens, a way will then be found to deal with the commercial and industrial problems which now appear to them so serious. The best Americanism is that which aims for stability and permanency of prosperous citizenship, rather than immediate returns on large masses of capital.

EUCALYPTUS FOR TIMBER.

In view of the prevalence of eucalyptus forests on Oahu the following bulletin of the U. S. Forest Service is of sufficient local importance to be reprinted in full:

The wood of eucalyptus has not been extensively used by manufacturers in the United States, because the supply has not been sufficient to establish a market. Blue gum, the most common species in California, has, however, competed with black locust for insulator pins, has given satisfactory service in chisel and hammer handles, and has been used locally for wagon tongues, axles, shafts, spokes, hubs and felloes. It is hard, strong and tough.

In cooperation with the State of California, the Forest Service recently completed a study of the mechanical and physical properties of the common eucalyptus. The tests, made at the State University at Berkeley, were to determine whether eucalyptus can be substituted for some of the hardwoods that are becoming difficult to obtain.

Blue gum is by far the fastest growing species. The height and diameter of trees from which the test places were taken, is given in the following table. All the trees were about fifteen years old:

SPECIES.

Common name.	Botanical name.	Diameter Inches	Height Feet
Blue gum.....	<i>Eucalyptus globulus</i>	30	101
Sugar gum.....	<i>Eucalyptus corynocalyx</i> ..	15	73
Karri.....	<i>Eucalyptus diversicolor</i> ..	16	72
Manna gum.....	<i>Eucalyptus viminalis</i>	12	60
Red gum.....	<i>Eucalyptus nostrata</i>	9	47
Leather-jacket...	<i>Eucalyptus punctata</i>	10	43
Red mahogany...	<i>Eucalyptus resinifera</i>	8	38

An important point in considering the value of commercial plantations of eucalyptus is brought out in the second table, which shows that the fastest growing are also strongest.

TESTS.

Species	Age in years	Number of tests	BENDING		COMPRESSION PARALLEL TO GRAIN	
			Modulus of rupture lbs. per square inch	Number of tests	Crushing strength, lbs. per square inch	
Sugar gum.....	15	5	25,344	11	11,290	
Blue gum.....	30	12	23,265	15	12,310	
Leather-jacket ..	15	3	19,267	10	10,908	
Karri	15	8	18,386	17	8,795	

Blue gum.....	15	28	16,900	34	8,190
Red Mahogany ..	15	4	14,550	2	7,920
Red gum.....	15	9	14,380	6	7,723
Manna gum.....	15	12	13,093	20	7,309

A comparison with Forest Service tests on hickory shows that 30-year old blue gum is stronger than hickory, and that 15-year-old sugar gum is nearly as strong as black hickory and 91 per cent. as strong as second-growth hickory.

The wood of very young and sappy trees is apt to warp, but that from more mature growth can be easily handled to prevent warping. Early seasoning should proceed slowly. Open piling is desirable; the stacks should be high to secure weight, and should be covered.

Several of the eucalyptus grow rapidly in California, and, under forest conditions, form straight, tall boles free from branches. They have, therefore, especial value as timber trees. —U. S. Department of Agriculture, Forest Service, Trade Bulletin 8.

U. S. FOREST SERVICE CIRCULARS.

The following particulars, as they possess some local interest, are quoted from recent circulars compiled by Mr. H. M. Hale of the U. S. Forest Service:

WOOD DISTILLATION IN THE U. S. IN 1905.

"The total consumption of wood used for distillation in 1905 throughout the United States was 676,739 cords, valued at \$2,010,611; and the products comprise 26,670,139 bushels of charcoal, 5,062,076 gallons of alcohol, 86,685,129 pounds of acetate of lime, 238,180 gallons of turpentine, and 1,039,980 gallons of tar and oil, besides 434,780 gallons of oil from pine distillation. The total for tar distillation from hardwood is very small. As a matter of fact, the figures do not even approximate the actual amount, but, instead, represent only the amount saved and refined. Owing to certain characteristics of the tar obtained from hardwoods, which make it of low commercial value, most of it is used for fuel, either in carbonizing the wood or in refining the liquor, and when so used no record is kept of the quantity produced."

WOOD USED FOR VENEER IN 1905.

"The absence of figures in the census reports shows that, down to 1900, veneering had not assumed the importance of an industry worthy of special attention. At the present time,

however, there are in the United States over 128 establishments which cut veneer, using annually more than 189,000,000 feet log measure, the equivalent of approximately 217,000,000 board feet, which yields 1,108,000,000 square feet of veneer. It is evident that the growth of the veneer industry has been strikingly rapid.

"Veneers are of three general classes—sawed, sliced, and rotary-cut. Sawed veneers, which have been longest used, are of highest grade. Sliced veneers rank next in order of quality. Although the returns from the manufacturers do not indicate the exact process, there is little doubt that 75 per cent. of the oak veneers are either sawed or sliced. The rotary process is very extensively employed for all woods except oak."

The importance of "Red gum" wood for veneering purposes is appreciable, as it furnished 21.8 per cent. of the raw material used. This is particularly important as the wood of this species has been utilized for this purpose for only a few years. Maple ranks second in quantity, furnishing 14.5 per cent. of raw material. Yellow poplar is the only other species furnishing more than 10 per cent. of raw material. The three species named furnished more than one-half of the total quantity of wood used. The data given is founded upon the statements of one hundred and twenty-eight manufacturers throughout the country. Among the woods used for veneer, besides the three above named, are included cottonwood, white oak, yellow pine, birch, basswood, elm, red oak, ash, walnut, beech, sycamore and tupelo, each of which furnishes its quota in the order named.

CONSUMPTION OF TANBARK IN 1905.

The statement of the consumption of tanbark in 1905 here given is based upon the reports of 222 firms operating 477 tanneries. The total amount of bark reported is 1,104,045 cords, of which hemlock constitutes 799,755 cords, or 73 per cent., and oak 304,290 cords, or 27 per cent. The average price per cord reported for hemlock bark is \$6.32 and for the oak bark \$10.44, making a total value of \$8,232,457.

The tanneries of Pennsylvania lead in the quantity of bark purchased, the total being 428,709 cords, of which 379,806 cords were hemlock and 48,903 cords oak. This is nearly double the quantity of bark purchased in Michigan, the State which ranks next in importance. Pennsylvania and Michigan are by far the largest users of bark, particularly hemlock, and together these two States purchased over 60 per cent. of the total quantity reported. In the purchase of oak bark Virginia holds first place with 73,871 cords.

Since tanneries are usually located in or near the regions

from which they draw their supply of bark, the assumption may fairly be made that, on the whole, the figures for purchases also represent approximately the production in the States mentioned. On this assumption, the leading States in the production of hemlock bark are Pennsylvania, Michigan, Wisconsin, West Virginia, Maine, and New York in the order named, aggregating 97 per cent. of the total production. Similarly, over 90 per cent. of the oak bark is produced by the following States: Virginia, California, Pennsylvania, West Virginia, Tennessee, North Carolina and Kentucky.

In addition to bark and chemicals, the tanneries use large quantities of extracts made from hemlock and oak bark and chestnut wood, together with a considerable amount of imported quebracho and gambier. Sumach leaves and plametto extracts are also used to some extent.

During the period which has elapsed since the Twelfth Census was taken the use of the extract of quebracho, a South American tree, has largely increased. Quebracho contains a very high percentage of tannin and gives excellent results when mixed with various quantities of domestic barks or extracts. This extract can be imported at a price which compares very favorably with the present price of domestic barks, and the drain on the supply of tanbark in the United States is thus considerably relieved.

NOTICE.

The annual meeting of the Farmers' Institute of Hawaii will be held at Kamehameha Boys' School, Honolulu, on Saturday, February 2, 1907.

The program will be as follows:

AFTERNOON SESSION.

2:30 p. m.—Business meeting.

Report of the Secretary-Treasurer.

Election of Officers.

4 p. m.—Inspection of the farm and shops of Kamehameha Manual Training School.

EVENING SESSION.

7:30 p. m.—Music.....Kamehameha Glee Club

Address of Welcome.....President P. L. Horne

Response and President's Annual Address.....

.....Mr. Jared G. Smith

Music.....Kamehameha Mandolin Club

Observations on Some Hawaiian Crop Blights..	.....Dr. N. A. Cobb
Music.....	Kamehameha Glee Club
The Camphor Industry.....	Mr. L. G. Blackman

A cordian invitation is extended to all who are interested.

F. G. KRAUSS,
Secretary and Treasurer.

TITLE PAGE AND INDEX.

A Title Page, Index and Table of Contents to Volume III is in preparation and will accompany the February number.

BY AUTHORITY.

APPOINTMENT.

Notice is hereby given that the Governor has, on the 4th instant, appointed Leonard G. Kellogg, Esquire, a Commissioner of Agriculture and Forestry, for the term of five years.

A. L. C. ATKINSON,
Secretary of Hawaii.

Executive Building, Honolulu, January 8, 1907.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagation and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

* Out of Print.

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FEBRUARY, 1907.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. IV.

FEBRUARY, 1907

No. 2

In the face of the general advancement which has taken place of late years in the development of the Territory, it is at once extraordinary and unfortunate that the legislation of Hawaii leaves so much to be desired in the way of affording adequate protection to the family homestead. In this particular we are far behind our simple English ancestors, for by the early common law of England real property could not be taken upon execution for the satisfaction of creditors, but the latter could only have recourse to the debtor's goods and chattels and to the profits of his land. As time advanced, however, the demands of a developing civilization, in an age more crude and elementary in its conception of natural justice and equity than our own, permitted the real estate of a debtor to be attached, and eventually it even became customary to incarcerate his body until the claims of his creditors were fully paid. A more enlightened age has abated the excessive rigors of these laws, and not only in the United States but in England the debtor's prison is unknown. It is in the former country, however, that the solicitude of the state has been most paternally extended to the assistance of the unfortunate debtor, and in most, if not all of the States, statutes are in force which may to an extent be said to reinstate the debtor to the position he occupied under the early common law.

The statutes to which reference is made are known as Homestead statutes, and their object is to afford protection to the home and to the liberty of unfortunate debtors, and to safeguard their interests against the exacting claims of creditors. At the same time they afford an industrious and honest man upon whom financial misfortune has fallen, an opportunity to reinstate himself as a useful member of society. Their benefit is thus not for the debtor alone, but in protecting the individual the interests of the whole community are advanced. The Homestead laws are so interpreted as to carefully guard against their provisions being used as a shield against the payment of just debts by a fraudulent and unscrupulous debtor, and certain debts are specially excluded from the homestead exemption. Of these the claims of labor and material-men may be mentioned and the debts secured by mortgage on the homestead signed by both husband and wife.

Two classes of homesteads are known, one based on an area which differs for "rural" and "urban" lands. The latter,

being situated in towns are less extensive than the former which usually are of sufficient size to constitute a small farm. In the other class of homesteads the value only is the basis. In either case the statutes provide that the head of a family shall be allowed to preserve his home for the benefit of the family, free from the molestation of creditors. Restrictions are usually imposed as to the value and extent of the property exempted, and means are provided for subjecting the excess over the exempt value to the claims of creditors. In some States the property secured may be worth as much as \$5,000, although generally the amount is somewhat less than this. As a rule considerable latitude is given to the terms "head of a family" and "family." As used under the homestead statutes it is in general sufficient that there is a collective body of persons subsisting in common and presided over by one who owes to the others a legal or moral obligation of support, founded upon relationship rather than upon contract. The right of homestead in some States attaches not only to freehold estates but to every interest in land which may be subjected to debt. The property protected embraces the dwelling house and all the appurtenances necessary to the maintenance of a home. In some States the homestead privilege extends to all homes, but in others it is first necessary to fulfill certain legal formalities in order to derive exemption, called filing a claim of homestead.

Of all the United States and Territories Hawaii is probably most backward in adequate legislation upon this subject. At present the value exempted from forced sale is a house lot not to exceed one quarter of an acre with the dwelling house, provided the same does not exceed \$250 in value, and one-half acre of taro land, if actually cultivated for family use. (Sec. 1830 of Revised Laws, taken from Civil Code of 1859.)

In order to encourage the proper agricultural development of this Territory, one of the first essentials is to secure the enactment of a substantial homestead statute. The importance of this was shown in the Forester, two years ago, by Judge Weaver, who, in an able paper outlined the general statutes obtaining in the various States. It is to be hoped that the coming Legislature will take this matter seriously in hand, and will bring the Territory into line with the majority of the United States which have adopted beneficial homestead laws.

An agreement of sale was recently made with the approval of the Governor between the Commissioner of Public Lands and Walter McBryde, by which the latter will eventually become the owner of the Kukuiohono lot of the Kalaheua land, Kauai. The contract is conditioned besides the purchase

price by the agreement that the grantee plants thirty thousand trees on the land, at the rate of three thousand a year, and at the expiration of ten years the government delivers a deed to the property.

The purpose of the sale is primarily to conserve the water supply, by reforesting a bare hilltop which at one time possessed an abundant natural herbage.

Walter McBryde has for some time past taken an active part in forestry work on Kauai and was one of the first in the Islands to recognize the immense value of preserving the forests of our watersheds, and to actively undertake in their conservation. The rehabilitation of Kukuiohono with forest trees will entail much labor, but its successful accomplishment is greatly to be desired.

One of the features of the lava ejected by the recent volcanic outbreak in south Hawaii has been the presence of numerous particles of olivin. Crystallized silica occurs in many of the former lava flows of the Hawaiian Islands, and generally is found in the form of the well known olivin. This stone belongs to the chrysolite group of minerals and is a frequent constituent of volcanic and meteoric rocks. It is of some commercial value when occurring in sufficiently large and good crystals. It is known in France as the "peridot," under which name it figures in jewellers' catalogues. The Hawaiian olivins are generally of very mediocre quality and of insufficient value to repay collection. They are also said to possess an additional disadvantage of undergoing rapid deterioration. Although usually quite small, many of large size have been found, notably on Hawaii. This mineral possesses great hardness and may be observed in the matrix even while the latter is in a semi-molten condition. The minute size of the specimens thrown up by the present outbreak, indicates that the flow has issued from no considerable depth.

In response to numerous requests, and in view of the developing interest in the cultivation of vanilla, we are arranging to publish in the Forester the salient features of Bulletin No. 21, of the U. S. Department of Agriculture, Division of Botany, entitled "Vanilla Culture, as practiced in the Leychelles Islands." The publication is by S. T. Galbraith, and is now unobtainable. It contains a review of the cultivation of vanilla and gives practical directions for starting a vanillery. The illustrations showing the method of artificial pollination are of great use. The bulletin has been loaned for reproduction in the Forester by the Superintendent of Forestry.

A general falling off of the value of exports of American cotton cloths to China during 1906 is reported by the Bureau of Statistics of the Department of Commerce and Labor. It is believed that this condition was due to over importation of cotton goods into China during the previous year. Some anxiety had been felt in the United States in consequence of this diminution but it now appears, in addition to the former overstock that the reduction in the imports by China is general and is not aimed exclusively at American products.

The total trade of Great Britain for 1905 amounted to nearly five billion dollars, and established a new record. The wave of trade prosperity as shown by the above figures appears to have affected almost all branches of industry.

FARMERS' INSTITUTE OF HAWAII.

ANNUAL MEETING.

The fifth annual meeting of the Farmers' Institute of Hawaii took place at the Kamehameha Boys' School on Saturday, February 2, 1907. An attractive program had been arranged by the Secretary, but owing to the continuance of the inclement weather which had prevailed of late, the attendance was sparse and the exercises were much curtailed.

I. AFTERNOON SESSION.

The day's proceedings commenced at 3 o'clock, when the meeting was called to order by the President, Jared G. Smith. The annual report and the financial statement were first read by the secretary-treasurer, and accepted. A copy of these will appear in a subsequent number of the Forester.

The President then reported the action of the Institute with reference to the recent agricultural exhibition, and expressed himself satisfied that the results which had been achieved fully justified the part which the Institute had taken.

It was stated by the secretary-treasurer that, owing to the limited time at his disposal, he had been unable to put into effect the preparation and circulation of a letter to members and to others interested in the society, bringing before their notice the necessity of rendering more stable the financial condition of the Farmers' Institute. The regular payment of annual dues would do much to increase the effectiveness of the work which was often hindered for lack of outstanding fees. Of the one hundred persons addressed, twenty had responded.

ELECTION OF OFFICERS.

The election of officers for the ensuing year now took place, and the following were again nominated and unanimously elected to serve in their respective capacities for another year:

President Jared G. Smith
 Vice-President Wm. Weinrich, Jr.
 Secretary-Treasurer F. G. Krauss

Messrs. Perley L. Horne, Swezey and S. Parker were elected Executive Committee for the year.

Jared G. Smith stated that he considered the executive committee an important department of the Institute upon which responsible duties frequently devolved. He cited the instance which occurred last year in which the committee coöperated with the Delegate to Congress in an effort to secure to the Territory a tobacco expert from the National Department of Agriculture, and the organization of an efficient soil survey of the Islands. President Smith believed that both these requests would be acceded to when funds became available for the purposes referred to.

Mr. Horne moved that the Farmers' Institute again bring before the Hon. Secretary of Agriculture at Washinton the importance to the Territory of the establishment of a soil survey and the appointment of an official thoroughly conversant in the cultivation of tobacco. The motion was seconded and carried.

It had been arranged to inspect the Kamehameha School farm, and the industrial shops of the manual training school, but the weather did not permit of this intention, and a most interesting part of the program had in consequence to be abandoned.

II. EVENING SESSION.

The evening proceedings commenced at eight o'clock. Mr. P. L. Horne, President of the Schools, extended the hearty welcome of Kamehameha Schools to the Farmers' Institute. He considered the Schools fortunate that the Institute should hold its annual meetings at Kamehameha, whose pupils received an agricultural training, and by the natural course of events, should become the future farmers of the Territory. The annual farmers' meeting at the Schools should do much to encourage and inspire those who were now fitting themselves to take their place in the domain of husbandry. He recognized the importance of the work which the Institute was doing, and wished that some way could be devised to bring its operations more clearly before the community. The best way to achieve this, he thought was for the Institute and all who were interested in the objects for which it was founded

to coöperate in an exhibition which would appeal directly to the interest of the public. The exhibition in which the Institute had lately taken part had no doubt been instrumental of many beneficial results, and should help to indicate the far reaching good to be gained by a wider effort at popularity. He would like to see established in Honolulu an annual county fair of the old New England type, in which every department of agriculture would find a fitting place. Such an exhibition should not be confined to the mere crops of field and farm, but should embrace such industries as bread and butter making. By this means the interest would be more general and the assistance of the ladies of the community would be invoked. This latter feature he considered of great importance in stimulating an interest in an annual agricultural exhibit, and in rendering it permanent.

Mr. Jared G. Smith, in response to Mr. Horne's address, spoke as follows:

PRESIDENT SMITH'S ADDRESS.

On behalf of the Farmers' Institute of Hawaii, I wish to thank President Horne and his efficient corps of teachers and helpers for their hospitality. It is always an inspiration to me and I am sure also to all who are interested in things agricultural, to meet with you for our annual meeting and note the progress which each year of development shows. It is a pleasure to see so many young Hawaiians and to know that they are being so well trained in agricultural and mechanical lines so that they may meet the obligations which the industrial development of this Territory will impose upon them. The future of this country depends to a large extent on the young men and women now growing up and I am sure that if you will live up to the wise teachings of your teachers, you will attain the fullest measure of good citizenship.

It is fitting that at least once a year we should consider what has been accomplished toward the advancement of the cause of diversification of industries. In 1901, when I came to Hawaii to inaugurate experiment station work for the United States Department of Agriculture, there was only one string to Hawaii's bow. The idea that there was a possibility of developing new industries was scoffed at and I remember that almost every one told me when suggestions were made as to the possibility of producing this or that, that that was an impossibility as every one who had tried to grow anything but sugar cane had lost every cent they had put into it. Looking back over the last six years, I note many things begun as well as many things accomplished and best of all I note a decided change in sentiment on the part of a great

many people who were undoubtedly sincere in their belief that sugar was the only possible crop. As a matter of fact, there are so many things that I hardly know where to commence and shall have to content myself with a mere enumeration.

Pineapples. Five canneries are now in operation and others are in process of construction whereas, in 1901, there was only the single cannery of the Pearl City Fruit Company. The capitalization employed has increased to over one million dollars, and as an illustration of the growth of this industry you will be interested to know that one of our new plantations is the largest in acreage and number of pines planted, in the United States. The shipment of fresh pines amounts to over ten thousand dollars annually and is capable of much greater extension.

Sisal. The beginning of the sisal industry dates back about fifteen years but has only become prominent within the last three years. It now ranks as one of the established industries and has only begun its full developmental period. Hawaiian sisal fiber has been pronounced not simply the equal of the best Yucatan but very superior to it, and the prices realized for it and the demand which is developing, promise to place our sisal fiber on a par in the world's markets with the best Manila hemp.

Tobacco. Experiments with tobacco have been carried on for four years and the 1906 crop grown by the Hawaii Experiment Station has been pronounced by all who have examined it, of very fine quality. There are a good many thousand acres of land in Hawaii capable of producing this weed and I want to say right here that tobacco countries are rich countries the world over. Tobacco may be an enemy of mankind, a luxury and to some extent a poison, but the development of a tobacco industry in a country demands a stable population. There is a good deal of "know how" required and it is not the kind of know how that can be readily transmitted to a class of laborers who are here today and there tomorrow. Skill and knowledge are essential to the production of good leaf and I am firmly convinced that the development of a tobacco industry in Hawaii will do its share towards giving these Islands a better class of population than has been considered necessary for the cultivation of sugar. Because of the value of the crop it is a small man's industry and I believe that our Hawaiian boys could with profit to themselves, take up tobacco cultivation.

Rubber. The cultivation of rubber producing trees has been entered into on all of the larger islands of the group and some of the trees are almost up to the bearing stage. Rubber cultivation in Hawaii has every promise of becoming an extremely profitable industry and this crop, like tobacco, is cap-

able of profitable development by small men or on a small scale.

Insect Control. Rapid strides have been made in the scientific control of injurious insects by the natural method, that is, the introduction and propagation of parasites; and by the method of direct control through the use of contact and internal poisons. Another striking example of insect control is the successful introduction into Hawaii of the top-minnows, small fish which feed upon the mosquito larvae. The whole subject of mosquito control in Hawaii dates back only four years.

Plant Breeding. A number of lines of plant breeding have been begun, notably the creation of new varieties of sugar cane and of new and improved strains of rice. This work is of necessity slow, especially with tropical plants which require many years to attain their fruition, but the results when obtained are vastly beneficial to the agricultural and horticultural industries.

Plant Diseases Control. The magnificent work of Drs. Cobb and Lewton-Brain on the diseases of cane and other cultivated crops is known to you all. The inauguration of these lines of agricultural work in this Territory marks a new era and is bound to prove vastly beneficial to every agricultural industry.

Animal Diseases. Of equal importance is the work being done in the control and eradication of animal diseases. Within three years glanders, one of the most serious contagious diseases of horses and mules, has been brought almost under complete control, and Dr. Norgaard's discoveries in regard to the function of lime as an animal food is of inestimable value to the stock industry.

Silk. Three separate demonstrations have been made of the practicability, and profit to be derived, from the cultivation of the silk worm and the mulberry. This is an extremely intensified industry which must be considered in relation to attaching a permanent population to the land.

Quarantine. Another material advancement is the establishment of a rigid quarantine against the introduction of dangerous insects and plant diseases from foreign countries.

Forestry. While much forestry work has been done in Hawaii for twenty years or more, it has only recently crystallized itself into a bureau of practical forestry. The establishment of forest reserves and their scientific planting with useful trees is a development of which Hawaii may well be proud. I believe that there is no other State or Territory which has done more or even as much, within the short time during which the forest service has been in operation.

Honey. The bee-keeping industry has developed remarkably within the last five years. The capitalization has been

quadrupled and the production increased in greater ratio, and I believe that we know more about the sources and composition of Hawaiian honeys than they do in most of the mainland States of their own product.

Fruit Shipments. A careful and detailed study has been begun of the difficulties attending the shipment of fresh fruits to the mainland markets. Our Hawaiian fresh fruit trade amounts to over one hundred thousand dollars per annum and is capable of indefinite extension and incidentally the employment of many farmers in its production. It has been demonstrated that there is a good market for papaias on the Pacific Coast, and I believe that the production of this wholesome fruit for shipment is going to be a big industry in these Islands.

This list might be almost indefinitely extended. I have not touched on the matter of fertilizer experiments, irrigation experiments, or the cultivation of many crops such as vanilla and the rosella.

I think that the Farmers' Institute is entitled to congratulate itself on account of its successful agricultural fair held in coöperation with the poultry men's association, and I hope that each year will see a bigger and better exhibition of Hawaiian products.

These are in part, the results of six years work by three scientific institutions, the H. S. P. A. Experiment Station, the Hawaii Experiment Station and the Board of Agriculture and Forestry. As to the exact cost of the work I do not know but I am sure that the amount expended represents only a very small percentage of the whole financial results. Taking the cost as \$100,000 per annum, I believe that no other hundred thousand dollars expended from public or private revenues has yielded larger money returns.

The developments outlined as a part of the result of six years work are good and I know that if the people of Hawaii will continue their support they will be better as each year progresses, but there is still one side where Hawaii is weak. The logical outcome of this active scientific investigation must be the establishment of an agricultural college, an institution for the training of men to do this kind of work. I believe that you will all acknowledge that the work already done is good. I believe that the people of Hawaii will heartily support an effort on the part of the coming legislature, to round out a complete and proper development of scientific agriculture in Hawaii by the establishment of a well endowed institution which shall teach young men and young women not only how to become scientific investigators, but to be able to support themselves and add to the wealth of Hawaii by direct application of their knowledge to the soil.

At the conclusion of Mr. Smith's address, Dr. N. A. Cobb gave a most interesting illustrated lecture entitled "Observations on some Hawaiian crop blights." This, together with Mr. L. G. Blackman's paper on the camphor industry will appear in another issue.

IMPORTANT PUBLICATIONS.

COMMERCIAL ATLAS.

Atlas of the World's Commerce, a new series of maps with descriptive text and diagrams, showing products, imports and exports, commercial conditions and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute and edited by J. G. Bartholomew, F. R. S. E., F. R. G. S.

Few recent publications are of such exceptional interest to the agriculturist or to the merchant as the Atlas of the World's Commerce, the early numbers of which have recently been received. The atlas presents the whole question of the world's products, imports and exports, with impartiality and exactness and although published in England, undue prominence is not accorded to the claims of the British Empire. From the merchants' point of view the world constitutes one vast commercial exchange. Every country to some extent relies upon the imports of other countries, and no country in itself is commercially independent. In this proposition is found the basis of the world's fiscal question.

The chief object of the compilers of the Atlas is to present by a series of large, self-explanatory maps the principal sources of the articles of commerce. In this manner is afforded a key to the merchandise of the world and a summary of its material resources. A brief examination of the map which is devoted to the production of coffee offers an illustration to the scope of the work. In this case a map of the world is presented, upon which the coffee growing countries are colored red, the tint being proportioned to the quantity of production. Upon the same map, the coffee importing countries are represented in blue, those of large consumption, that is, where over six pounds per head per annum is used, being colored darker than those of smaller consumption. The chief lines of export are also shown in bold outline. Arranged on the same page, are smaller maps exhibiting the similar local conditions in countries figuring largely in coffee production, such as Brazil, Java, and the West Indies. The whole set of maps devoted to coffee form a complete exposition of the present question of demand and supply of this product. By means of devoting a separate plate to each important article

the commerce of the world is graphically illustrated. The first twenty-one plates are used to set forth the general physical, political and economic aspects affecting the subject treated of. Ten plates are devoted to communication and transport, and about twenty-five to regional maps showing industrial areas, routes of commerce, vegetation and general products. Nearly fifty plates exhibit the distribution of food products; fifteen the distribution of textile materials; and twenty-five, the distribution of mineral products. The following miscellaneous products are also given special plates: India rubber, 3; Timber and Cabinet woods; Tobacco, 4; Ivory, Gums, Resin and Wax; Vegetable oils; Opium; Fish oils; Hides and Skins; and Dyeing materials. Altogether one hundred and seventy-six large pages of colored plates are given, containing more than a thousand maps and diagrams. The plates are accompanied with descriptive text, which is practically a dictionary of the commerce of the world. The material embodied in the Atlas is compiled from many hundred trade returns and commercial reports from all countries of the world. The work is one of great importance and should be of great value, not only to those interested in agriculture but as a work of reference in private and public libraries. To the merchant its merits are unquestionable.

The Atlas is issued at a total cost of about three dollars, in 22 periodical folio parts, issued fortnightly. It is to be obtained from Messrs. Frederick Wane & Co., New York.

RUBBER LITERATURE.

The Ceylon Rubber Exhibition, Colombo, September, 1906. Lectures and Discussions on Rubber Cultivation and Preparation. Illustrated. Messrs. A. G. & J. Ferguson, Colombo, Ceylon. 4 shillings.

This publication will be found of great interest to the growers of rubber in Hawaii. The plantation rubber industry of the East Indies is of comparatively recent origin, and its rapid development during the last five to seven years is one of the most wonderful achievements of tropical agricultural history. The first attempt at introducing the industry in Ceylon was in 1876, but the planters did not at first show much interest in the project. The Botanical Department of Ceylon, India, and The Straits Settlements, however, foreseeing the future of the new undertaking, steadily proceeded to propagate and distribute the plants and although the value of their work was not at that time fully realized it is from these sources that we are indebted for much of the present knowledge of the subject.

Not until the failure of coffee in Ceylon did the few planters who remained in the colony turn their attention to rubber. The *Manihot* (Ceara) was the first species tried, but the yield from the tree proving disappointing many thousands were ruthlessly cut down and preference given to the *Hevea*. The destruction of the *Manihot* species and the prejudice which arose against it is to be regretted as it is now grown in Ceylon with satisfactory results.

After a brief history of the rubber industry in Ceylon, the book we are considering gives a general account of the successful exhibition of rubber products which has recently been held in Colombo. It is, however, the Lectures and Discussions which took place during the course of the exhibit which is particularly interesting to Hawaiian readers. These form the greater portion of the volume and their scope is sufficiently important to give their table:

Rubber and Coffee in Ceylon, by Dr. J. C. Willis.

Rubber in Southern India, by E. G. Windle.

Rubber Cultivation and The Future Production, by G. H. Wright.

Rubber Vulcanization, by Kelway Bamber.

Rubber Insect Pests, by E. E. Green.

Prevention of Fungus Diseases of Rubber, by G. T. Petch.

Camphor and its Distillation, by G. Bamber.

Relative Qualities and Different Grades, by S. Brett.

The Preferred Forms of Plantation Rubber, by C. K. Smithett.

Rubber in the Malay Peninsula, by C. B. Carruthers.

Rubber Shipment to London, C. G. Devitt.

Tobacco Cultivation in Sumatra.

During the course of the exhibition a practical demonstration of the whole process of rubber manufacture from the tree to the blocked product ready for export, was given. The demonstration proved a specially appreciated part of the undertaking. Practical methods of tapping were also shown to a large gathering of planters by Mr. Herbert Wright, Controller of the Government Experiment Station at Peradenuja, who conducted parties around the gardens, making explanations, answering questions and giving practical demonstrations.

We recommend the perusal of this book by all interested in the development of the rubber industry.

TITLE PAGE TO INDEX.

The Title Page and Index to Vol. IV are still at press and will be issued as soon as possible.

THE MANGOSTEEN.

To the Editor of the Forester and Agriculturalist.
Dear Sir:

It will doubtless be of interest to many of the readers of your paper to learn that another tree of the *Garcinia Mangostana*, or true Mangosteen, has been located growing in the gulch near the home of Mr. George Wilcox, at Lihue, Kauai. Not long since Mr. Wilcox sent to me some of its leaves for identification and, although the tree has never fruited there is no doubt in my mind that it is a true mangosteen, and was probably planted at the same time as those now growing in the premises of Mr. Francis Gay of Kauai, and Mrs. Horner of Lahaina, Maui.

Yours truly,

GERRIT P. WILDER.

OAHU'S FOOD RESOURCES.

The following from the Pacific Commercial Advertiser of January 31, is of interest as showing the latent possibilities of this island to develop its potential food resources, if subjected to a long period in which it could depend upon no outside supplies:

"It is not beside the mark to say that if the population of Oahu were subjected to a blockade, it could keep its market supplied with a larger and fresher variety of food, with the exception of fresh beef, than it has now. In such a case everybody would raise something to eat and make a business of it and Pearl Harbor would be drawn upon, as never before, for fish. Take vegetables, such as the Chinese, Japanese and Portuguese cultivate now; the area of their production would be indefinitely added to. Taro and rice-planting, honey-making, duck, pigeon, poultry and hog-farming, sheep and cattle-raising on the high hills, banana culture—all these things would be prosecuted with an energy and zeal which would make Oahu the best fed spot of the Pacific. Haphazard methods of production, say in the poultry business, would disappear under the system which a common need would impel. Science, released from its sugar studies for the time being, would turn to the eradication of general insect pests; small manufactures would spring up and we should make condensed milk, preserves, raise and prepare our own tobacco, produce silk, cotton and to some extent hempen cloth—perhaps by crude methods, but nevertheless. There is no end to the things that could be done here to keep the population well

fed and tolerably well clad if necessity, the mother of invention, were to be invoked."

The Forester heartily agrees with the possibility of agricultural development outlined above and foresees the time when such a condition of affairs will have been brought about, not by the pressure of external force, but by the natural expansion of her industries. With regard to the allusion to the scientific control of insects, it may be of interest to say that of the three scientific institutions at work in Honolulu in economic entomology, only one is engaged primarily in the suppression of insects affecting the sugar crop. The one alluded to, moreover, is a private one maintained by the sugar planters themselves. Its entomological work although in the main devoted to the protection of the industry, on whose prosperity it owes its own *raison d'être*, also embraces entomology generally. The entomological work of the Federal Station, and of the Territorial Bureau of Agriculture is chiefly directed to the eradication of such pests as affect the citrus, alligator pear, mango, and other fruit crops, and other enemies attacking plant life generally. The ability of the sugar planters to protect their own interests in this matter is thus a direct benefit to the community at large, as it allows the entomologists of other institutions to devote their whole energy to pests and blights more nearly affecting the welfare of private residents.

NEW FARMERS' BULLETINS.

The following publications have recently been issued and may be obtained free from the Secretary of Agriculture, Washington, D. C.:

Management of Soils to Conserve Moisture, with Special Reference to Semiarid Conditions. By George H. Failyer, of the Bureau of Soils. Pp. 32, figs. 7. (Farmers' Bulletin No. 266.)

Directions for the cultivation and management of different soils, drainage of wet lands, preparation of seed beds, etc., with suggestions as to crops suitable for semiarid regions.

Experiment Station Work, XXXVII. Compiled from the publications of the Agricultural Experiment Stations. Pp. 32, fig. 1. (Farmers' Bulletin No. 267.)

Contents: Breeding corn—Buckwheat—Sugar beets on alkali soils—*Alfilaria* as a forage plant—Apple bitter rot—Grass mulch for orchards—Hardiness of young fruit trees—Protecting cows from flies—Effect of silage on milk—Cold storage of cheese.

Industrial Alcohol: Sources and Manufacture. By H. W. Wiley, Chief, Bureau of Chemistry. Pp. 47, figs. 10. (Farmers' Bulletin No. 268.)

This bulletin is issued in response to the numerous inquiries sent to this Department regarding the manufacture of industrial or denatured alcohol, and contains the Federal law relating to its manufacture and use, the sources from which it may be obtained, and methods of manufacture.

Industrial Alcohol: Uses and Statistics. By H. W. Wiley, Chief, Bureau of Chemistry. Pp. 32, figs. 10. (Farmers' Bulletin No. 269.)

This bulletin gives a number of uses of industrial or denatured alcohol, especially those of direct interest to the farmer; also statistics on its production in the United States, Great Britain, France, and Germany. It is designed to supplement Farmers' Bulletin No. 268.

Modern Conveniences for the Farm Home. By Elmina T. Wilson, formerly Assistant Professor of Civil Engineering, Iowa State College. Prepared under the direction of the Office of Experiment Stations. Pp. 48, figs. 26. (Farmers' Bulletin No. 270.)

Suggestions and directions for installing in the farm home modern plumbing, heating plants, and lights, and for disposing of the wastes and sewage, with plans and illustrations of buildings and grounds.

A Successful Hog and Seed-corn Farm. By W. J. Spillman, Agriculturist in Charge of Farm Management Investigations, Bureau of Plant Industry. Pp. 16, figs. 5. (Farmers' Bulletin No. 272.)

This bulletin explains the system of management of a farm of 100 acres devoted to raising hogs and growing seed corn. It gives the feeding value of the different crops grown, care and feeding of pigs and hogs, and the average yearly outlay and income.

Experiment Station Work, XXXVIII. Compiled from the publications of the Agricultural Experiment Stations. Pp. 332, figs. 4. (Farmers' Bulletin No. 273.)

Contents: Loss of nitrogen from soils—Manure as affected by food—Continuous corn culture—Pasturing wheat—Storage of sweet potatoes—Rotting of potatoes in storage—Hog cots—The disinfection of stables—The effect of horsetail weeds on horses—Treatment of calf scours—Preserving eggs—Wheat bran—Testing individual cows—Clean milk—Cleanliness in the dairy—Grading cream—Paraffin in dairying.

PASPALUM THE MONOPOLIST.

It is all or nothing with paspalum. The big coast grass is an uncompromising monopolist. So far as experience on the Richmond goes, no other grass has a chance of living with it. Clover, prairie, lamb's tongue, rye, and others have been completely ousted from paddocks to which the paspalum has been introduced, and there are many dairymen who declare that even buffalo and the despised Paddy's lucerne cannot live against it. This is all the more extraordinary when one considers the great feeding qualities of paspalum. It naturally gives the best bucket results when it is of moderate growth, but even after it gets away feet high to seed it is relished and eaten low by stock. In the later stages, however, it tends rather to make beef than milk, and dairymen prefer to keep it in bounds. Within the past few years its spread on the Richmond has been prodigious, and how much the ever-advancing output of butter is indebted to it would be difficult to estimate. It is not that many other grasses don't do well on the coast, but that the paspalum comes strongest when the others, with the exception of the summer couch, are feeblest. It breaks away with the spring, and growing more like a well-cultivated field of green wheat or oats than ordinary grass, it continues to yield profusely all the summer. Of course, it wants rain, but still it can make a heavy growth on moderate falls, provided they are frequent. It solved for the coast the question of a permanent supply in normal seasons of natural feed, for there are other grasses to keep stock moving, if not in full profit, during the winter.

Its spread has been extraordinarily rapid, and is still proceeding, and most River farmers are its sworn friends. But there are those who dislike it because of its greed. They see a day not far distant when paspalum will be the sole grass of tens of thousands of cows on the Richmond, and prophesy that such a position will not be in the interests of dairying. They argue that the cow confined to one article of diet is as likely to get out of gear as the man who is expected to live on porridge and so draw dismal pictures of the future. The argument is hardly a sound one, because the cow after all only varies her diet from one grass food to another, and the variation in the properties consumed would probably be slight. Nevertheless it is one of the first principles of sound stock-raising that fresh pastures and grasses are of the utmost value, and no one who had the choice of an all-paspalum diet for his herd and a diet of mixed grasses would be likely to choose the former. Those dairymen are probably following the wisest course who are keeping the big grass off at least a portion of their farms, and thus maintaining a change of pastures.

How long they will be able to do this is doubtful, as the paspalum does not wait to be hand-seeded, but is always widening its own domain. Men who have gone the whole way on paspalum argue that it can easily be ploughed out. Certainly the roots when eaten low can be turned over, but the operation is followed by a vigorous growth of seedlings, which take a heap of controlling. That is on the flats. On a lot of the rough steep country, where the paspalum is so much at home, the difficulty is intensified, and the grass doubly secure. But so far there is not much ground for apprehension. Cattle show no signs of sickening of the grass and the returns from it are of the best. And there appears no reason why this should change. Paspalum has now been in this country for a number of years, and may be said to have passed a fair trial. Probably what will happen is that so rank a grower will in time exhaust even such rich country as the best areas of the North Coast, although the presence on land of a beast to the acre is a big source of improvement. If the land does go off, dairymen will have to give more attention to changing and cultivation, and perhaps fertilising with special chemicals.—Sydney Morning Herald, Nov. 21, '06.

WAHIAWA AND PINEAPPLES.

The following data are from information collected by C. Elschner, C. E., F. H. C., Chemist.

Wahiawa pines are far superior in aroma and sweetness to Florida fruit.

Demand is likely to exceed supply for many years.

Three canneries are in operation.

The Wahiawa soil is chiefly decomposed lava, but it varies considerably.

In regard to color of the soil, red, black, brown and greyish blue varieties are frequent.

The red soil is decomposed lava, poor in mineral plant food.

The black soil, though rich in ammonia, does not show the expected results in the development of growth. This may be due to the high percentage of manganese which it contains.

Soils formerly covered with guava scrub are generally not best suited to pines.

Algaroba, glue, and leguminous plants, which indicate the presence of a certain amount of lime are considered good predecessors of pines.

Although fertilization of the Wahiawa soil is not at first absolutely essential, it is advisable to enrich it from the first, in order to prevent exhaustion.

HAWAIIAN NAVEL ORANGES.

FINE RESULTS PRODUCED AT KAUMANA BY CAREFUL CULTIVATION
OF TREES.

The first of this year's crop of Hawaiian navel oranges came from Kaumana last week and appearance as well as the flavor of the fruit speak well for the chance that it has to gain a place on the market. It will be remembered that last year the fruit was a disappointment. Its flavor was good but the size was far too small to command attention. An experiment was tried this year, certain trees being picked out and fertilized while others were left unfertilized. The fertilization produced marked results, for the trees so treated have produced fruit fully equal to any that California can show while the other trees gave the same small fruit of last year. With this encouragement a large number of new trees have been planted.—Hilo Tribune.

UNITED STATES DEPARTMENT OF AGRICULTURE, IRRIGATION AND DRAINAGE INVESTIGATIONS OFFICE OF EXPERIMENT STATIONS.

Washington, D. C.

BULLETIN NO. 173, THE EVOLUTION OF CORN-HARVESTING MA-
CHINERY.

By C. J. Zintheo.

In the principal corn growing regions of the United States, as a rule only the grain is harvested, the stalks being left in the field to be eaten by live stock, or raked and burned. This bulletin describes the various machines which have been developed for harvesting the corn plant and preparing it for stock feed. It gives statements of cost, the length of service which may be expected under ordinary conditions, and the work which can be done with the various machines.

Application for this bulletin should be made to the Director of the Office of Experiment Stations, Washington, D. C.

PORK-PRODUCING FOODS.

According to an exchange, the Wiltshire (E.) county council carried out recently some pig feeding experiments which are of an extremely interesting and instructive nature. The dry feed was soaked over night, at the rate of a peck to five gallons of water, except when milk was used, when it replaced its own volume of water. The potatoes were boiled, and the foods were not given them in a sloppy condition. Appended are the points given to the different feeds:

- (1) Barley meal, milk, potatoes, 1,000 points.
- (2) Barley meal and milk, 903 pints.
- (3) Maize meal and milk, 877 points.
- (4) Maize meal and bean meal, 590 points.
- (5) Barley meal, 519 points.
- (6) Maize meal and pea meal, 489 points.
- (7) Maize meal, 484 points.
- (8) Barley meal and bran, 409 points.
- (9) Maize meal and bran, 404 points.

The most suitable meat for bacon production was obtained from barley meal and bran. Maize alone was found to produce excessive fat.—*Journal of Agriculture.* W. A.

WHITEWASH THAT WILL NOT RUB OFF.

A first class whitewash is made by dissolving 2 lbs. of ordinary glue in 7 pints of water, and when all is dissolved, adding 6 oz. of bichromate of potassium, dissolved in a pint of hot water. Stir the mixture up well, and then add sufficient whiting to make it up to the usual consistency, and apply with a brush in the ordinary manner as quickly as possible. This dries in a very short time, and, by the action of light, becomes converted into a perfectly insoluble waterproof substance, which does not wash off even with hot water, and at the same time does not give rise to mould growth, as whitewash made up with size often does. It may be colored to any desired shade by the use of a trace of any aniline dye or powdered coloring, while by the addition of a small proportion of calcic sulphite its antiseptic power is much increased.—*Queensland Agricultural Journal.*

BY AUTHORITY.

BRUSH FIRES ON TANTALUS.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905 it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of twelve months (12) from date, within that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys, above the makai edge of the Eucalyptus forest, the Makiki reservoir and the foot of Round Top, unless the written permission of the District Fire Warden has been first obtained. The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out."

The District Fire Warden is Mr. Walter M. Giffard.

RALPH S. HOSMER,
Chief Fire Warden.

Honolulu, T. H., Feb. 9, 1907.

THE FUTURE OF HAWAII.

The following communication from O. P. Austin, Chief of the Bureau of Statistics of the Department of Commerce and Labor, Washington, is sufficiently interesting to our readers to reproduce in full:

DEPARTMENT OF COMMERCE AND LABOR, BUREAU OF STATISTICS, WASHINGTON.

January 30, 1907.

Dear Sir: I beg to express to you my thanks for the map which you send me, entitled "Crossroads of the Pacific." It is a very interesting and striking presentation of the importance of Hawaii to the commerce of the Pacific, and of the commerce of the Pacific to Hawaii; and whether we consider it in the first mentioned light, of the importance of Hawaii to Pacific commerce, or in the second, of the importance of the Pacific commerce to Hawaii, we can but see in it a bright future for the Hawaiian Islands and their people. That the commerce of the Pacific is sure to grow in the immediate future more rapidly than that of any other ocean section of the world is generally conceded and indeed can not be doubted when we take into consideration the prospect that we shall within a few years open a new door to that greatest of oceans, the door of the Panama canal. Not only is it the greatest of oceans, but it furnishes the highway for interchange between great sections of the world which are mutually interdependent, and in those interchanges Hawaii can but profit as the great central station, the crossroads, as your map very aptly puts it, of the various highways connecting Asia and Oceania on the one hand with America on the other, and when the Panama canal shall be opened, with Europe also.

But there is another thought which I want to take this occasion to express, and that is that the true prosperity of Hawaii lies, in my opinion, in the development of highways in the interior of the islands rather than highways on the ocean. By this I mean that the greatest prosperity which could come to your islands is through an opening up of the interior and such diversification of industries and producing power as would be possible under such conditions. A section able to produce such a variety of tropical articles as may be produced in the Hawaiian Islands, and having free access to a market demanding such enormous quantities of those various articles as does the market of the United States, ought to become not merely prosperous, as it already is, but one of the most prosperous and perhaps the most prosperous of all the tropical communities of the world. With the power to produce sugar, of which the United States imports more than one hundred million dollars' worth a year; with the power to produce coffee, of which we import from seventy-five million to one hundred million dollars' worth annually; with the power to grow rubber, of which we import fifty million dollars' worth annually; with the power to produce tropical fruits, of which we import thirty-five million dollars' worth annually; with the power to produce sisal, of which we import fifteen million dollars' worth annually; and with the power to produce cocoa, of which we import nearly ten million dollars' worth annually, the possibilities of increased prosperity in Hawaii seem to me very great, and if you can bring about a development of "crossroads" in the interior of your islands, as commerce has already made those islands the crossroads of the ocean, you will see a still further improvement in that wonderful prosperity of which we are, all of us so proud.

Very truly yours,

O. P. AUSTIN, Chief of Bureau.

Mr. H. P. Wood, Secretary, The Hawaii Promotion Committee,
Honolulu, Hawaii.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION.

BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by E. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. IV.

MARCH, 1907

No. 3

The work of Dr. N. A. Cobb at the H. S. P. A. Experiment Station is likely to prove of great value to the agricultural industries of Hawaii, and the Territory is extremely fortunate in having the opportunity to benefit by the knowledge of such an authority on plant pathology. Dr. Cobb will remain in the islands until June 30, during which time he will be actively engaged in determining the plant diseases which have become established here. At the expiration of this period he will proceed to Washington, and will take with him such material as he has not opportunity to work up in Honolulu. An excellent occasion is now afforded to get plant diseases examined and reported upon, whether obscure and little known ones or those of more general prevalence. To this purpose Dr. Cobb has issued an invitation to all interested in the subject to forward to him specimens for examination. The importance to agriculture of a wide response to the circular, which appears in this issue, is very great, as the data gathered by this means will afford knowledge not only of the presence of various plant diseases, but will help to determine the range of their distribution and will form a basis for determining the best means to successfully combat them.

Upon his arrival at Washington, Dr. Cobb will assume control of the new office of Crop Technology, of the Bureau of Plant Industry, United States Department of Agriculture.

This number contains the first of a series of special articles on entomology, to be complete in four or five issues, by Mr. Jacob Kotinsky, of the Division of Entomology, Board of Agriculture and Forestry. Mr. Kotinsky has long been a regular contributor to our pages upon entomological subjects, but the articles now commencing are upon special matters, and the series will be complete in itself.

We have recently received from Mr. Jared G. Smith, a most interesting paper upon Cassava cultivation. Pia is a well-known Hawaiian food, and the product of cassava is also one of the chief comestibles of the inhabitants of the West Indies. Mr. Smith's article will appear in the next number.

*ENTOMOLOGICAL NOTES.***BOARD OF AGRICULTURE AND FORESTRY.****Division of Entomology.**

BY JACOB KOTINSKY.

PRINCIPAL CITRUS INSECTS IN HAWAII.

INTRODUCTION.

As yet these Islands can not boast of very numerous or very thrifty orange, lemon, or other citrus orchards with the possible exception of limes. Economic conditions have thus far barred the undertaking of citrus culture on a commercial scale. Citrus culture is nevertheless even at present a subject of no little importance on these Islands, to say nothing of its future prospects. Scarcely a door yard but is stocked with one or more trees of the citrus tribe. Though we do depend upon California for oranges and lemons to a considerable extent, our own supply fills an important place. But for an abundance of seed and not so attractive color, it is conceded that the native orange excels the imported article. In many Hawaiian homes the native orange is given first choice for private family consumption, although the Californian may be served in the presence of guests. Although not much in evidence in our markets at present, we feel keenly a scarcity of our native orange whenever it occurs. It thus becomes evident that by giving these trees the attention they require we should follow a wise course.

UNINTENTIONAL INSECT IMPORTATIONS.

Whatever the condition of our citrus plants years ago, they are at present beset with a number of foes, among which insects play an important part. Indiscriminate importation of plants from all over the world without inspection naturally led to the establishment of numerous pests. It is an established fact that all the insects affecting citrus plants in the Territory are of foreign origin. Practically all of them are of universal distribution, having followed the citrus plants about the world. Some of the insects are confined to certain citrus districts of the world. We may be consoled, perhaps, by the knowledge that many well-known pests of the citrus are not yet in the Territory, whether this absence be on account of unsuitable climate or other unknown causes. Our present system of rigid inspection of incoming vegetation promises to limit our citrus pests to what we have already acquired. And so long as this system is continued we may rest assured that no new pests will gain entry. This Territory and the State

of California are the only communities in the Union that pursue this policy of protection against foreign insect invasion. One can hardly explain why it is that the Federal government discriminates against plant life. While all possible precaution is taken by the U. S. Department of Agriculture to prevent the introduction and spread of parasites affecting man and his domestic animal, no such protection is extended our useful plants. Federal control of insect pests already established is now advocated. But why begin so late? Why not attack the evil at the root and forestall the introduction of foreign pests?

INTENTIONAL INSECT IMPORTATIONS.

During the past fourteen years the government of these Islands was busily engaged in the importation of predacious and parasitic insects, many of which are important enemies of some of our citrus insect pests. It is difficult to say what the fate of our citrus plants would have been without these, but the trained eye readily sees the amount of help rendered us by these six-footed friends.

CLASSIFICATION OF CITRUS INSECTS.

Before proceeding with the description of the various insect enemies of our citrus plants, it is advisable to acquaint the reader with a skeleton of the scheme of classification of the groups into which these insects fall. This grouping may be viewed from either the standpoint of their structure or that of the manner in which they do the injury. Generally speaking, insects injure plants, depending upon the structure of their mouth parts, either by biting portions of them, as do Japanese beetles and various caterpillars, or by puncturing the tissue and sucking up the sap. Arranging the insects according to their structure, notice is taken of the kind of mouth, i. e., whether sucking or biting, as well as the presence or absence of organs of locomotion—legs and wings—the number and texture of the wings, the difference between the sexes, etc. The economic importance of the nature of the mouth and the bearing it has upon remedial measures will be discussed later when remedies are considered.

(To be continued.)

*ANNUAL REPORT OF THE SECRETARY-TREASURER
OF THE FARMERS' INSTITUTE OF HAWAII.*

Mr. President and Members of the Farmers' Institute of the Territory of Hawaii:

With this annual meeting of the Farmers' Institute we complete the fifth year since its organization in January, 1902.

Since the last annual meeting, held at Kamehameha Schools, February 3, 1906, a regular quarterly meeting was held at the library of the Territorial Board of Agriculture on May 12, and a second regular meeting was held on September 29 at the same place.

The first meeting was given over entirely to the subject of coöperative marketing of Hawaiian agricultural products, under the following program:

1. Report of the Committee on Coöperative Marketing.
2. "The Necessity of Growing New Fruits in Hawaii," by Mr. William Weinrich, Jr.
3. "Some Advantages of Coöperative Marketing," by Mr. John Emmeluth.

President Jared G. Smith opened the meeting with an introduction showing the great benefits derived from coöperation elsewhere.

Interesting discussions followed the report of the Committee on Coöperative Marketing and the reading of Mr. Emmeluth's paper. General interest was evinced in the subject, and it is hoped good results will follow.

The September meeting was devoted to "Hawaiian Fruits and Their Culture." This neglected phase of our agricultural resources is so fruitful of development that our Institute may well give the subject increasing attention.

The program was as follows:

1. "Fruit Culture as an Industry in Hawaii".....
.....President Jared G. Smith
2. "Hawaiian Fruits".....Dr. William T. Brigham
3. "Tropical Fruits as Food".....Dr. Edmund C. Shorey
4. "Horticultural Insect Enemies" (Exhibition of Specimens).....Mr. D. L. Van Dine

This meeting brought out a large attendance and much interest was shown in the subjects presented. A profitable discussion followed.

In November the Hawaiian Poultry Association invited the Farmers' Institute to make an agricultural exhibit in coöperation with their Second Annual Poultry Exhibition. Although the time available to plan such an exhibition was short, and

the time of year unseasonable for making a representative collection of agricultural products, the Farmers' Institute consented to take part and succeeded in getting together a small but creditable exhibit of fruits. The Hawaiian Agricultural Experiment Station and the Bureau of Forestry also made extensive exhibits.

(The classes under which the exhibits were entered, and the list of prizes offered, together with the names of the winners, have already appeared in the *Forester* and are therefore omitted.)

From the interest shown in this little exhibition and the expressions of commendation made at the time, it is believed the Farmers' Institute could extend its influence for the advancement of a better and more diversified agriculture if it would take the initiative in establishing an annual agricultural fair at a season when farm and orchard products are at their best. Such a fair should include exhibits of dairy products, livestock and agricultural implements, as well as the domestic arts and rural interests generally. Naturally, some time and expense would be attached to such an enterprise, but doubtless the various agricultural bodies would give freely of their time to such a work, and if the matter were rightly presented to the Legislature they, too, would no doubt make an appropriation sufficient to defray reasonable expenses. One or two thousand dollars per annum for this purpose would create a profitable promotion work at home and extend its influence well beyond our shores. Of the amount needed as stated above, about one-fourth should be set aside for cash prizes for best exhibits.

Acting upon a suggestion from our Delegate to Congress, which was presented before our last annual meeting, it was advised that a special meeting of the Executive Committee of the Farmers' Institute be called to consider the recommendations of Delegate Kalaniana'ole regarding the requests that soil surveys be inaugurated and a tobacco expert be provided by the U. S. Department of Agriculture for these Islands.

Accordingly, a meeting was called for February 13, which resulted in drafting two letters, one to the Honorable Secretary of Agriculture and the other to our Delegate, earnestly soliciting their aid in securing the desired assistance.

Copies of these letters follow:

(Copy of Notice Sent to Executive Committee, Feb. 10, 1906.)

Honolulu, February 10, 1906.

Dear Sir: A special meeting of the Executive Committee of the Farmers' Institute of Hawaii, to consider the recommendations of Delegate Kalaniana'ole regarding soil surveys

and a tobacco expert for Hawaii, will be held at 7:30 p. m. on Tuesday, February 13, at the library of the Territorial Board of Commissioners of Agriculture and Forestry on King street.

F. G. KRAUSS, Sect'y.

February 15, 1906.

Hon. J. K. Kalaniana'ole,
 Delegate to Congress from Hawaii,
 Washington, D. C.

Dear Sir: Acting upon your suggestions as set forth in your favor of January 4, 1906, to the Farmers' Institute, Honolulu, Hawaii, in which you desire to further the diversification of the industries of our Territory by recommending that Hawaii secure from the United States Department of Agriculture, through the Hon. Secretary of Agriculture, soil surveys of at least a part of each island in the group. Also, we note that in your consultation with Secretary Wilson, the Hon. Secretary offers to follow up the work by assigning a tobacco expert to establish the industry on a firm basis.

Recognizing the benefits that would result from such aid by the United States Department of Agriculture, a special meeting of the Executive Committee of the Farmers' Institute of Hawaii was called on the evening of February 13, at which time it was voted that the Hon. Secretary of Agriculture be petitioned to lend us every possible aid for the furtherance of a soil survey and the assignment of a tobacco expert.

We enclose herewith a copy of our letter to Secretary Wilson.

Very truly yours,

(Signed)

F. G. KRAUSS,
 Secretary.

February 15, 1906.

Hon. James Wilson,
 Secretary of Agriculture,
 Washington, D. C.

Dear Sir: Our Delegate to Congress, the Hon. J. K. Kalaniana'ole, desiring to further all proper efforts for the improvement and diversification of the industries of our Territory, advises us, under date of January 4, 1906, of his consultation with you in regard to securing soil surveys of at least a part of each island in the group.

We are informed that you have promised favorable consideration to the matter, and, further, should you decide that this work can be extended to Hawaii, you will follow it up by sending a tobacco expert to establish that industry on a firm basis.

Appreciating the great benefits that would result to Hawaii by such aid from the United States Department of Agriculture, the Farmers' Institute of the Territory of Hawaii respectfully and earnestly petition the Hon. Secretary of Agriculture to use his best efforts to secure for our Territory as complete a soil survey as possible for each of the several islands forming the Territory of Hawaii, and also to assign a tobacco expert to these Islands to assist in establishing the tobacco industry, in which the Hawaii Experiment Station, with Territorial aid, has already made so favorable a beginning.

Trusting that this petition for the extension of Hawaii's agricultural resources will meet with your favorable consideration, we are,

Respectfully yours,

(Signed)

PERLEY L. HORNE,
ALEXANDER CRAW,
F. G. KRAUSS,
Executive Committee.

JARED G. SMITH,
President.

FINANCIAL STATEMENT.

Statement of Secretary-Treasurer for the Year Ending with the Annual Meeting, February 2, 1907.

	Receipts.	Disbursements.
Cash on hand beginning of year (handed over by the retiring Secretary-Treasurer, February 3, 1906).....	\$20.74	.....
Eight annual dues for 1906 at \$1.00.....	8.00	.....
Twenty annual dues for 1907 at \$1.50.....	30.00	.....
Stationery, printing, postage, etc. (including \$17.65 expenses in connection with Agricultural Exhibition)		\$42.00
Cash prizes awarded at Agri. Exhibit.....		15.50
Cash on hand.....		1.24
	<u>\$58.74</u>	<u>\$58.74</u>

Unpaid Bills—

20 subscriptions to Hawaiian Agriculturist and Forester at 50c.....	\$10.00	.....
300 letter heads	3.50	.....
Cash on hand		\$ 1.24
Deficit		12.26
	<hr/>	<hr/>
	\$13.50	\$13.50
	<hr/>	<hr/>

From the above statement it will be seen that the treasury is left with a deficit of \$12.26. The expenditures for the past year have been larger than in former years because of the agricultural exhibition held in coöperation with the Hawaiian Poultry Show.

The expenses connected with this exhibition were:

Cash prizes	\$15.50
Prize ribbons (ribbons \$2.70, printing \$1.50).....	4.20
Exhibit cards	4.50
Labor	2.00
Blue pencils .....	.20
Bunting	5.45
Plates	1.35
	<hr/>
Total	\$33.15

The last two items, amounting to \$6.75, it is anticipated the Poultry Association will assume.

Early in November, 1906, the following circular was sent out to one hundred persons supposed to be interested in the Farmers' Institute movement, out of which twenty have responded by paying their dues for 1907. Probably more would respond if seen in person, but the limited time at the disposal of your Secretary-Treasurer has made this practically impossible.

Respectfully,

F. G. KRAUSS,
Secretary-Treasurer.

Dear Sir: It has been decided to raise the annual dues of the Farmers' Institute of the Territory of Hawaii to \$1.50. And upon payment of same, members will receive free the Hawaiian Forester and Agriculturist, which is the official organ of the Institute in Hawaii.

The Farmers' Institute dues were formerly \$1.00 per annum. The regular subscription price to the Hawaiian Forester and Agriculturist is \$1.00.

A copy of the Forester and Agriculturist containing the proceedings of the last quarterly Farmers' Institute meeting is being sent you under separate cover.

The annual dues are now payable, and an early remittance will be appreciated.

Hoping for a continuance of your membership,

Respectfully,

(Signed)

F. G. KRAUSS,
Secretary-Treasurer.

"JULIE" MANGO.

The Bulletin of the Trinidad Botanical Department, for January, contains the following note on this popular variety of mango:

The mango known as the "Julie" is one of the best, or perhaps the very best, of all the introduced kinds, and is daily gaining in favor, the demand for plants at the Government Experiment Station being larger than for any other kind. Among the reasons for this preference are: (1) Its excellent flavor; (2) Keeping qualities; (3) Suitability for transport; (4) Early bearing; and (5) Its ability to produce regular annual crops.

Its flavor recommends it to the majority of consumers, and as it has little or no fiber, it is eminently suitable for table use. Probably no mango known keeps good a greater length of time, and its tough skin renders it easy to pack for transit to long distances.

It fruits at a very early age, often commencing at four years from planting, and sometimes earlier. The tree has a dwarf, bushy habit, but in time grows to a large size. The "Julie" is one of the most regular croppers of all the mangoes.

It has been exported to England from Trinidad, and has arrived in first-class condition.

Compared with it, the famous Jamaica No. 11 is "out in the cold," as it can be eaten with a spoon, while the No. 11 is characterized by the large amount of fiber which adheres to the seed. It is a long way superior to the "Peters" or "Malda," and is always found in superior condition to that mango, which has the fatal fault of being frequently sour at the center.

Altogether, "Julie" takes the first place among the cultivated mangos of Trinidad, and the trees suffer less from disease than most other kinds. It is certainly a fruit which can be highly recommended for cultivation for export.

SOME HAWAIIAN CROP BLIGHTS.

Paper read by Dr. N. A. Cobb, H. S. F. A., at the last Annual Meeting of the Farmers' Institute of Hawaii:

"There is a widespread but erroneous notion that most organic things are more or less inherently frail, and that they decay or rot for reasons to be sought in this frailty.

Fruits rot; timber decays. It is often assumed that these occurrences are due to inherent tendencies of the things that rot or decay.

It is true that all living things have a definite period beyond which they cannot continue in the form of one individual. Our own limit has been set at three score and ten years to four score years, or thereabouts. Reaching this limit the human organism runs down. Appetite fails, and food ceases to nourish as it formerly did. The muscles become enfeebled and the nerves no longer respond to the old stimuli. Recollection fades, and as it has been beautifully phrased we "fall on sleep."

But this consummation is remarkable on account of its rarity rather than its commonness. As a rule before a man can live out his allotted span he is carried off by some accident or disease. He dies not because of some inherent quality but because of some outside cause. He loses his life by accident, or is carried off by some parasitic organism such as that of consumption, cancer, plague or smallpox.

Wishing to combat an erroneous notion by drawing a parallel I take our own life history as one part of the illustration because it is one with which all are more or less familiar. I think you will have little difficulty in assenting to the statements I have made.

Now what is true of mankind in this respect is equally true of all things organic. The losses due to rot and decay are as a rule not due to something that was inherent in the organic matter that rotted or decayed. In other words it was due to the attack of some organism or to some accident, and was not something that was at that time inevitable. These organic things rot, decay or otherwise perish, as a rule, long before their allotted span, just as we do. And it is just as true of these things that their life can be prolonged as it is that we could prolong human life much beyond the present statistical limit if we would only live up to what the more advanced among us vividly realize to be demonstrated fact. No one doubts that if all the individuals of this or any other community would live up to the standard of cleanliness and moderation easily shown to be best for us, the mortality statistics would be much altered. The amount of suffering would be much less, and the sum of human happiness would be so much the greater.

In the much humbler sphere to which I invite your attention for a few minutes the same holds true. The various parts of cultivated plants such as flowers, fruits, stems, foliage, and roots which we value for various reasons are by no means so inherently frail as they are often assumed to be. There is really nothing in a piece of sound fruit that can cause it to decay. When it decays it is usually because of some accident or some destructive organism. Because we do not fully understand what is taking place we say, "Oh, it just rots." And as the occurrence is a very common one we have grown to look upon it as unavoidable. Nevertheless within limitations the very opposite is true. So far as anything in itself is concerned almost any piece of sound fruit, even the most perishable kind, might remain sound for a long period. Give it the necessary conditions and you may see this at any time. Tin a pineapple or place it in cold storage and it will last for a long time, and if the operations be carried out in the right way, for a very long time indeed. The essence of this preservation is preventing the access of outside destructive organisms, or so lowering their vitality that they are comparatively harmless.

So with timber. There is no cause within itself why a post set in the ground should not last for centuries. The other day a friend showed me a piece of timber that had served in the foundation of an English house for over 700 years. It appeared perfectly sound. The beams in certain substantially built European chateaux have lasted for centuries and are today as sound as ever, in fact appear to possess valuable properties that less aged timber does not possess, as is evidenced by the fact that makers of musical instruments pay high prices to be allowed to dismantle these buildings and remove the old timber for use in the construction of wooden parts of musical instruments.

In the course of the few moments devoted this evening to the blights of our crops it will therefore be profitable to note the extent to which the previous remarks hold true, for if it prove true that in most instances our crop products are carried off before their time, it behooves us to inquire into the causes, with the object of ascertaining whether some of the losses are not preventable. You will observe that in many instances commercially valuable remedies are at once suggested as a result of an investigation into the causes of what were once looked upon as "just common rot such as we have always had."

"Just rot" may be as old as time, but no matter how aged it be it must not simply on that account escape re-examination in the light of the new truths made known in recent times through the investigations of scientific men. We must beware of thinking that because a thing always has been it therefore always will be.

I am wholly unprepared at the present time to give anything like complete observations on Hawaiian crop blights. I can give only a few notes on some of them. One of my objects will be to

call attention to the way in which anyone so disposed may assist in the work of collecting information on this subject."

Dr. Cobb then gave a series of lantern illustrations of some of the most noteworthy of the insect and fungoid enemies of Hawaiian crops and of timber. The subject of these will form a special illustrated article to appear in the next number of the Forester. At the conclusion of his address Dr. Cobb gave instructions for the forwarding of insect and other specimens by mail, and invited all who could to supply him with any such pests they should be interested in. The particulars given are included in the special article on the next page.

BY AUTHORITY.

SPECIAL WARNING NOTICE.

FIRES TO CLEAR LAND—WAIALUA DISTRICT, OAHU.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has first been obtained, within that portion of the District of Waialua, Island of Oahu, lying within the following boundaries:

On the South by the Waialua-Waianae District line; on the Southwest by the South branch of the Kaukonahua Stream; on the West by the Waialua Agricultural Company's new ditch from the Wahiawa dam and an extension of the line of the same, following approximately 700 foot contour, to the Waimea boundary; on the North and East by the Waialua-Koolauloa District line.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. A. M. Nowell of

Wahiawa.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., March 19, 1907.

PINEAPPLE CROP BLIGHTS.

The April issue of this publication will be of exceptional interest to pineapple growers. Dr. N. A. Cobb has in preparation a special illustrated article upon some of the blights of the pineapple industry, which will contain information of the greatest importance to growers of the fruit.

HOW TO SEND CROP DISEASES BY MAIL.

The forwarding of specimens by post is usually an easy matter. It is only necessary to enclose the specimens in a tin or wooden case such that the specimens may be fully protected from the handling to which the ordinary postal matter is subjected.

The most important point is that the specimens arrive in the freshest possible condition. To this end they should be gathered and packed shortly before the mail leaves for Honolulu. A few hours extra time in transit sometimes makes a great difference in the state of the shipment on arrival. This matter is therefore an important one, and, fortunately, in most cases, a little thought will make it no more difficult to comply with this condition than to neglect it.

If it can be done it is best to send the material in its natural state, that is, not preserved in any fluid. In the case of the softest and most perishable matter that can not be sent except in fluid, the best way is to place the specimens in a preservative mixture made by adding two parts of strong formaldehyde to one hundred parts of water, or one part of strong wood alcohol to two parts of water. After placing the specimens in a bottle, the bottle should be filled full of the preserving fluid so that there shall be no bubbles after the cork is inserted. It is best, unless the corking is uncommonly well done, to seal the cork over with wax or paraffin.

In sending matter of this class be careful to send all the stages that can be mustered, from the very earliest stages to the very latest. It is not necessary to send a large amount of material, but every stage possible should be included.

Blighted leaves and twigs may be placed loosely in a tin. The tin should be a close one unless the material will be several days in transit, in which case it may be advisable to puncture the tin with a few small holes.

As a rule, roots should be sent with the soil attached.

It is not best, as a rule, to send specimens in an ordinary envelope, but it is better to send them thus than not at all. Some specimens, such as dried leaves and bark, may be sent in this way if wrapped in several folds of soft cloth.

In case any special method is necessary, the empty package and the necessary preservatives will be forwarded free by post, after the receipt of specimens in the ordinary way proves ineffective.

Bottles containing fluid should be enclosed in boxes in packing material so as to preclude all possibility of breakage.

Specimens of leaves or twigs sent in their natural condition should not be gathered when wet, or, if gathered wet, should be allowed to dry until they resume their dry-weather appear-

ance. If enclosed in a package wet they are likely to become mouldy before arrival, and this is very undesirable. Roots should be moistened a little—just enough to preserve them in their normal condition until they arrive in Honolulu.

It is very desirable that notes should accompany the specimens. Give the condition of the plant or crop, the variety, its age, length of infestation, soil, nature of the present season, kind of culture, estimated monetary loss, etc.

Specimens should be addressed:

DR. N. A. COBB,

H. S. P. A. Experiment Station,
Honolulu.

DUCK EGG INCUBATION.

The method of incubating duck eggs as practiced by the Chinese of Hawaii is somewhat peculiar. A special room is devoted to this use, within which a bin is built, about three feet high, running round the room. Within this receptacle are placed ordinary wooden barrels lined with felt paper. The eggs to be hatched are spread on trays in the sun until they attain a temperature of from 102 to 103 degrees. They are then placed in the barrels layer upon layer, a thin cloth being inserted between each, and a heavier cloth covering the whole. The eggs are turned regularly by removing the layers of cloth one by one, with eggs upon them, and by replacing first the one taken from the top of the barrel. At the proper time the eggs are removed from the barrels and placed upon trays on racks above the bin. As soon as they are hatched the young birds are sold to the large ranches, at the rate of about \$50 per thousand.

THE "PAPAW" OF THE UNITED STATES.

The two cultivated and six wild species of Eastern North American shrubs and small trees, to which the name "papaw" is commonly applied by the Americans, are species of *Asimina* (natural order *Anonaceae*) closely related to the sweet sop or sugar apple of the tropics. The two cultivated species bear attractive flowers and edible fruits. One will grow in the open in New York State. The true papaw of the tropics, *Carica Papaya*, is not in any way related to the above-mentioned species. It is called in the United States "melon papaw" for the sake of distinction. It grows in the open only in South Florida; but is frequently in conservatories north of the frost line.—The Agricultural News, Barbados.

THE FUTURE OF HAWAIIAN RICE.

The presence of a large population of Japanese in Hawaii has given rise to a demand for Japanese rice. Although the Hawaiian rice is of excellent quality, and finds ready acceptance among the white residents and the Chinese, the peculiar characteristics of the rice to which the Japanese have been accustomed, has brought about an enormous importation of rice to Hawaii. With the idea of producing this at home and at the same time of stimulating the local rice industry, which for many years for different causes has been in an unfavorable condition, the United States Experiment Station has lately commenced a series of experiments to develop a rice best suited to our local condition of cultivation and to the peculiar requisities of the market.

The depression of the rice industry in consequences of the demand for the Japanese product commenced some years ago, and in consequence of the Japanese rice requiring no milling, many of the most important Hawaiian rice mills ceased operation. During the recent Russian war the Oriental supply of rice greatly diminished and Louisiana became the chief source of rice, which was grown from Japanese seed. It is with the idea of giving the home producer the benefit of the large local demand that the experiments alluded to are being conducted.

Hitherto the cultivation of rice in this country has been in the hands of growers who have been contented with primitive methods. A general depletion of rice lands has consequently taken place and at the same time the seed used has become greatly impoverished. A close observation of a rice field will reveal many empty stalks and many areas within which seed has not germinated. The length of growth, too, will be seen to vary considerably and much stunted rice will be noticeable. Besides these disadvantages the fields will be found to be invaded by an innumerable host of grasshoppers, chiefly confined to the edges of the fields, which levy as large a toll upon the ears as the persistent rice-bird. Together with the solution of the above difficulties the experiments will aim at evolving a rice possessing superior cultural, yielding, milling and culinary properties.

About one hundred and thirty varieties are being examined in the trial beds, received from trained agricultural explorers of the Department of Agriculture, who have for this purpose together investigated the rices of all the producing countries of the world. The various rices now being experimented with afford every diversity of growth and period of maturity. One promising sample from China, possessing the typical short kernel of the Japanese rices, ripens in seventy days. Other varieties show no sign of flowering, one hundred days after planting. The rice beds show every stage of condition and maturity. Some

samples are ten feet high and others fully low. Some are leafy and others possess almost bare stalks. Some varieties are sturdy and others show a tendency to droop. Every shade of color from a pearly white to a dull black hull is to be seen interspersed into numerous yellow and brown.

The plant breeder proceeds in this work with as much method and precaution as the breeder of stock. He has, however, this advantage in his favor: the greater number of individual members to experiment with and the greatly reduced period of generation. Having decided upon the superior merits of a particular variety, he with infinite care, generally based upon elimination of individuals, selects three of his best plants. The potential yield of each of them is then exactly determined per acre, and the heaviest producer is then reserved as the mother plant from which all future rice of that variety will be grown. In this manner a pure stock of known parentage is determined.

Each variety in the trial fields is thus treated in successive seasons until the most suitable is determined. This is a long and tedious process. Many beneficial results are also evolved by artificially crossing two or more distinct breeds. This phase of the work is one of unlimited potentialities and enables the breeder to attain an ideal standard. If by these methods a rice can be developed yielding one bushel per acre more than is now obtained, the cost of the experiments would be many times repaid in the first year. But the station confidently hopes to achieve much more than this.

The methods of improving plants by artificial means may be summarized as follows:

First: Inducing variation by altering condition of soil and environment, and by conveying the pollen of one variety to the ovary of another.

Next: The selection of desirable varieties, taking not the seed only, but the whole plant as a unit.

Lastly: The establishment of the power of the parent plant to transmit its acquired characters to its progeny.

The artificial crossing of rice, as, of course, with all plants, is brought about by means of the flower, in which the organs of reproduction are situated. The rice flower is a perfect one in which both sexes are represented. The six stamens contain the pollen which fertilize the ovary. In the case of the rice flower both cross and self fertilization takes place. When artificial cross fertilization is brought about the plant breeder first removes the pollen bearing organs to prevent self fertilization, and also protects the stigma, by means of a thin gauze from chance cross fertilization. At the proper time the desired pollen is introduced. The resulting cross is a blend of the characteristics of the two parents. Such operations are conducted with as much care as in the breeding of stock, and the results of successful

crosses may have a much wider economic effect than the establishment of a new breed of cattle.

The rice fields upon which the above experiments are being conducted are situated on King street, near Kalakaua avenue, and the work is in charge of Mr. Frederick G. Krauss.

RECENT PUBLICATIONS OF INTEREST TO AGRICULTURISTS.

Message to the Legislature of Hawaii, by George R. Carter, Governor. Honolulu, February 20th, 1907.

Among much that is of general importance, the annual report of the Governor contains several paragraphs which relate directly to agriculture. With respect to the foundation of a Territorial Agricultural College, Governor Carter writes:

"Your attention is called to a special report of the Board of Education, conforming to a resolution of the last session of the Legislature, on the question of a Territorial Agricultural College. This report covers the laws under which such institutions have been established, and recommends ways and means for an agricultural college in Hawaii. The benefits conferred by such an institution will be apparent to you, and I concur in approving the report."

The preservation to the public of recreation grounds and parks has been a matter which has received particular attention of late, and we are glad to see the Governor's continued interest in this important policy. The attention of Legislature is directed to this work in the following terms:

"The rapid development of parks; of open spaces with green lawns; of recreation spots, illustrates a high degree of culture in our community and a deep interest in the welfare of those who can not afford the luxury of a garden. The recognition is general of the civic advantages of such beauty spots. The progress has been rapid, and it is suggested that legislation providing for a general park system would be opportune. It would facilitate the employment of experts and widen their field of usefulness. It would aid in the importation and distribution of flowers and decorative shrubs. At present the only nursery maintained in the community is that of the Bureau of Forestry, which, of course, deals only with trees. Such legislation should aim to stimulate the movement in all parts of the Territory."

The construction of county and homestead roads is one of great importance to the welfare of a class of the community from whose courage and industry the stable prosperity of the

country will in future years derive great benefits. The extension of the road system is adverted to by the Governor, and we trust that the Legislature will deem the time opportune to assist, by this means, the numerous citizens who have recently taken up homesteads. The severity of the recent storms, which have fortuitously terminated the protracted drought, has tested the rural road system, and in some cases demonstrated the necessity of building permanent and substantial highways.

During the two years ending December, 1906, nearly three hundred homesteads have been established throughout the Territory, of a total area of over nine thousand acres. The development of a beneficial homestead policy on the part of the Territorial officials is a particularly gratifying feature in the recent history of agriculture, and we congratulate the Commissioner of Public Lands on the excellent results which have been achieved.

Incorporated with the Governor's message are the estimates of appropriations for the coming biennial period for the Federal Agricultural Experiment Station. The projected investigations for which assistance is required include work affecting the rice, tobacco, silk, pineapple, citrus fruit and honey industries, and the establishment of effectual marketing of tropical fruits.

A Preliminary Report on Rice Investigations by F. G. Krauss, Expert in Charge of Rice Investigation, Hawaii Agricultural Experiment Station, Honolulu. Press Bulletin No. 19.

Rice is, next to sugar, one of the important Hawaiian crops. The industry has recently been declining through increasing competition with Japanese and Louisiana rices, and to some extent through deterioration of the local product. A series of experiments has therefore been begun by the Hawaii Experiment Station to determine what improvements in methods of cultivation, harvesting, fertilization, milling, breeding and selection can be introduced to bring about the rehabilitation of the industry. These experiments are made possible by the generous contribution of the Bernice Pauahi Bishop Estate and also through the use of lands placed at the Station's disposal by the Ii Estate, Ltd.

Three projects or lines of work have thus far been planned for these investigations, as follows: Rice culture; rice breeding; and fertilization and rotation.

The investigations relating to culture include tillage, seed-age and harvesting. The slow, laborious methods of tillage prevalent in Hawaii are familiar to all, and the introduction of specially-designed machinery is being carefully considered. The primitive process of transplantation will also probably be

improved and may be supplanted either by drilling or by broadcast sowing. As great a development is anticipated in the harvesting methods, and the Forester for November, 1906, contains a description of the first use of a modern harvester in a Hawaiian rice field.

Rice breeding is a phase of the work calling for expert and painstaking investigation. So much has been done in breeding new wheats and corn that there is every assurance that the present experiments will develop a rice specially fitted to our needs and of a full harvest yield. By continuous selection and elimination a pedigreed seed stock is being evolved which may in time almost double the yield obtainable from unselected seed.

The use of suitable fertilizers, the determination of a proper crop rotation and the investigation of rice diseases offer a wide field for experiment, and each of these features is being actively studied by the Expert in Charge.

FARMERS' BULLETIN NO. 274.

Forage-crop Practices in Western Oregon and Western Washington. By Byron Hunter, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 40, figs. 4.

This bulletin is a reprint of Bulletin No. 94 of the Bureau of Plant Industry, and contains information and suggestions concerning hay making and the growing of forage crops west of the Cascade Mountains in the States of Oregon and Washington. It also describes the climate and the conditions of the farming lands of that region.

FARMERS' BULLETIN NO. 275.

The Gipsy Moth and How to Control It. By L. O. Howard, Entomologist. Pp. 24, figs. 7.

Life history and description of the Gipsy Moth (*Porthetria dispar* L.), the territory infested in the United States, its natural enemies, remedies, etc., with statements as to the measures taken by the State of Massachusetts and the Federal Government for its control.

N. B. The above two publications are obtainable free, from the Secretary of Agriculture, Washington, D. C.

The following publications have also been recently issued and will be referred to more fully next month.

Proceedings of the Hawaiian Entomological Society, Vol. 1, part 2.

Third Annual Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii for the Year Ending Dec. 31, 1906.

PUBLICATION WANTED.

The First Report of the Board of Commissioners of Agriculture and Forestry, 1904, is out of print. The Superintendent of Forestry is desirous of obtaining a few copies of the publication, and will be very glad to forward stamps for postage to anyone who will kindly notify him that they have a copy to spare.

ALASKA-YUKON-PACIFIC EXPOSITION.

WORLD'S FAIR, 1909.

The exposition to be held in Seattle in 1909 is creating great interest, and every effort is being made by its promoters to insure success. The chief object of the undertaking is to exploit Northland and Oriental trade, and the two years remaining before its opening are devoted to perfecting the plans necessary to its accomplishment.

In endeavoring to develop the natural resources of Alaska, Yukon and the Pacific Northwest, and in demonstrating the importance of Pacific Ocean trade, the projected exhibition should be of some value to the Hawaiian Islands, by showing the part they play in the economy of the Pacific. The awakening of the interest of the world in the resources of this vast ocean region, the wonderful internal development which it is itself evincing, and the increasing importance of its position in the world's commerce, alike will be made important features of the exposition.

It is anticipated that the object lesson of the fair will teach merchants and manufacturers of the Orient and the Occident the needs of the people of their respective markets and will demonstrate the best method of increasing their business. Oriental buyer and occidental seller, as well as occidental buyer and oriental seller, will be brought closely together through the various exhibits, to the mutual advantage of each.

The exposition site comprises about two hundred and fifty acres of the campus of Washington University. The grounds are particularly favorably situated for the undertaking, and besides possessing in themselves every advantage of natural beauty, have the additional attraction of fine stretches of waterfront on lakes Union and Washington and splendid views of the perpetual snow of Mount Rainier and Mount Baker.

It is intended to construct permanent buildings for the exhibits, which will, upon the closing of the fair, be appropriated by the University for educational purposes.

CORRESPONDENCE.

Editor Hawaiian Forester and Agriculturist.

I have read with interest the article "Paspalum, the Monopolist," copied from the Sydney Morning Herald, in your February number, which accords this grass the credit that it has well earned, rather grudgingly, and after the years of trial when it has never been found wanting as the pasture grass *par excellence*. It seems to me, judging from a limited experience with this grass at Wahiawa, when I introduced it in 1899, that our colonial cousin of the Herald is "making a mountain out of a mole hill." While this Paspalum (Dilatatum) has the propensity, by mere hardiness and adaptability, to hold its own against less valuable grasses, it has none of the dangerous aggressiveness of some of the grasses imported to these Islands, and no one need fear getting too much of it, for its value to the stockmen who want a good sod-producing pasture, can not be over-estimated.

Even the wild Paspalum which covers all our uplands here on the Islands is easily killed by cultivation, and I can see no reason from my experience, why the new one which is attracting so much attention, will be more difficult to keep in subjection on cultivated lands, for it only spreads from seed, and extension of crown, where it is pastured; does not send out runners like Bermuda, Para and other grasses. I would say to all who want a good pasture grass, don't be afraid of Paspalum Dilatum.

Yours truly,

BYRON O. CLARK.

Honolulu, March 25, 1907.

HAWAIIAN COFFEE.

"To assist and extend the cultivation of coffee in Hawaii data has been secured relative to the method of cultivation, planting, topping, shading, fermentation, growing, and marketing of the coffee trees and coffee bean, besides an investigation of the diseases and insect pests of coffee. The cultivation of coffee is now on a sound financial basis in this Territory. All who are now engaged in the production of coffee are doing so at a very slight margin of profit. However, any considerable extension of the industry depends on aid given by the National Government, either through a duty on coffee brought into the United States from foreign countries or by a direct bounty to be paid on all coffee produced in the United States by the labor of American citizens. There are 300,000

acres of land in the Hawaiian Islands available for the production of this crop; with a duty of 2 cents per pound, or with a direct bounty of \$30 per ton, Hawaii could produce 30 per cent. of the whole quantity now consumed within the United States, and this maximum could be attained within ten years.

"There is no other industry comparable with the coffee industry for the support and maintenance of a European citizen population. The coffee belt is the most salubrious in the island, and the whole industry is one to which white men would readily turn their attention, provided the National Government would give to this industry the same protection that is afforded to sugar and other crops. Assuming that the average yield of sugar per acre is 4 tons, and that every acre of cane requires two years for its growth, it will be seen that there is a protective tariff of \$68 on every acre of cane grown in Hawaii. The American sugar tariff of \$34 per ton is not entirely prohibitive as regards the importation of sugar from foreign countries. Coffee is a white man's industry, and as such it should receive protection equal to that given to sugar cane. A duty of 2 cents per pound would yield about \$20 per acre protection. A duty of 5 cents would undoubtedly prove prohibitive to foreign competition, and would lead to the investment of \$100,000,000 of outside capital in Hawaii during the next five years."—Jared Smith, in his article "Agricultural Experiment Work," in Governor Carter's annual report.

ISLAND POULTRY YARDS.

Mr. F. H. Krauss has recently established a Poultry Farm at Kalihi, under the above designation. He will import and breed mainly S. C. White Leghorns and Barred Plymouth Rocks, and is ready to furnish eggs for hatching or the table, and breeding stock.

A NEW COMMISSIONER.

As this number of the Forester goes to press, the news has been received of the appointment by Governor Carter of the Hon. Paul R. Isenberg as a member of the Board of Commissioners of Agriculture and Forestry, to fill out the unexpired term left vacant by the resignation of Mr. L. A. Thurston. Further notice of this change in the personnel of the Board will appear in a later issue.

TITLE PAGE AND INDEX.

The Title page, Index, and Table of Contents of Volume III accompanies this number.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

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HONOLULU, HAWAII.

VOL. IV

APRIL, 1907

No. 4

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER ^{and} AGRICULTURIST

VOL. IV.

APRIL, 1907

No. 4

The resignation of Mr. Thurston from his position of Commissioner of Agriculture and Forestry is to be regretted by all who have been associated with him in the work of the Board of which he was President. The present efficient status of the forestry system in Hawaii, and of agriculture in general, owes much to his ability and efforts on its behalf, and to him is to be attributed the inception of many of the beneficial enactments which have been made of late years for the benefit of the agricultural industries of the Territory. Among the many duties of a busy life, we hope that Mr. Thurston will still find a place to assist in furthering many of the projects associated with the work which he is now relinquishing.

The election of Mr. W. M. Giffard to the Presidency of the Board of Commissioners of Agriculture and Forestry at a recent executive meeting of the Board, will be received with approbation by all readers of the Forester. It will be remembered that among the many services which Mr. Giffard has rendered to the cause of the diversified industries of Hawaii, is to be included the projecting and institution of this publication itself, of which he became first editor. Under the new President of the Commissioners of Agriculture and Forestry we have the assurance of a continuance of the efficient and vigorous course of action which has marked the Board's policy in the past.

By far the most important event to the agriculture of this Territory which has been recorded for some time, is the provision by the Legislature of a sufficient fund to establish and maintain a well equipped Agricultural College. The exigencies of modern life have made it incumbent that the agriculturist of today, in order to be efficient and to render his land fully remunerative, be a man of wide knowledge and experience, whose methods are founded upon the substantial basis of practical science. The days have long since passed which only demanded of the tiller of the soil that he should follow the slow and laborious footsteps of his progenitor and be content with a scanty harvest wrung from the unwilling earth. With such unprogressive and conservative methods the agriculture of the day has no concern, and the country, whose people are contented with them must as long as they obtain, remain backward and undeveloped.

The necessity of imparting the technical knowledge necessary

to modern husbandry by means of scientific educational institutions has only been properly appreciated in comparatively recent times. It has been brought about by a number of different agencies, some of them operating from without and others having their inception in the industry itself. The cumulative effect of the conditions referred to, taken as a whole, has been to render ever more and more exacting the amount of special knowledge and training necessary in the successful agriculturist. The quantity of expert information now demanded is so great that no individual can acquire it from mere personal observation or from serving an apprenticeship in the routine of an ordinary farm. It is therefore necessary that educational institutions be established where the sound practices of modern agriculture may be acquired. To effect this, recourse must be had to well nigh every department of human knowledge. The geologist, the botanist, and the chemist must be consulted, and physics, physiology and the mechanical arts must alike yield their assistance. The laws determining heredity must be investigated and those influencing the perpetuity of beneficial individual traits investigated. The science of bacteriology will be required to teach an understanding of various operations of the dairy which formerly were relegated to chance. The practices of the modern forester must be evoked to render productive sterile wastes and to reclaim areas denuded by the improvidence of a thoughtless generation.

Of those agencies operating from within which have necessitated the application of scientific and other modern knowledge to agriculture, may be briefly mentioned the inherent tendency of all cultivated crops to develop disease or invite the attacks of insect pests, when grown upon an unprecedented scale on the same ground for many successive generations. It is not necessary in this country to dwell too long upon the object lesson which has been before it of this phase of the question with regard to our staple industry. In the early history of Hawaii when sugar cane was only grown in such small quantities as to satisfy the local requirements of the natives, it is improbable that the plant was attacked to any appreciable extent by either fungoid or insect pests. As the industry has developed, however, and the area of production increased to extraordinary proportions, together with the growth of successive crops upon the same land, the development of special breeds of cane has rendered the crop itself susceptible to the ravages of special disease, and has also facilitated the introduction of enemies from other countries. So great has been the effect of these onslaughts that were it not for the prompt and energetic application of entomological and other scientific methods it is questionable whether a ton of sugar could now be exported from the Islands. With regard to the sugar planter, the enormous ex-

tent of the industry, enables him in Hawaii to equip and maintain a scientific establishment, with a corps of expert officials, to combat the evil. With the agriculturist, however, there is often no such recourse and he must often rely upon his own knowledge and experience to act promptly in matters affecting the very existence of the venture upon which he has invested his capital. Nor is it the large industries which have to assert their well-being by a constant scientific warfare. In some countries, as is known to every reader of agricultural history, whole industries have been destroyed for lack of promptly instituting scientific remedies when the enemy was yet in its incipient stage. In many instances communities which have become enriched by a successful industry, have become utterly impoverished in a few seasons by the failure of their staple crop under the attack of disease. Coffee, vanilla, the grape vine, and many other industries have both made and ruined the fortunes of countries, and the latter phase has unquestionably been due to the lack of proper scientific knowledge, and a lively sense of the impending danger. Referring again to more local conditions, it does not take great observation to discern that even with all our boasted scientific knowledge, the mango crop of the islands is in danger of suffering materially unless the continual application of modern knowledge be exerted on its behalf. Our taro crop, essentially a primitive industry and one at first thought which should be immune from such dangers as have been referred to, is threatened with more than one disease. The condition of our rice industry was lately so precarious that the coöperation of both local and federal assistance was enlisted to discover suitable remedies to reinstate it among our remunerative agricultural pursuits. It is only by recourse to the accumulated knowledge of the sciences as understood and intelligently applied by modern experiment and practice that a substantial and permanent improvement can be achieved in this industry. But by these helps, an almost double yield of improved grain can be predicted, at a smaller cost than that necessary to produce our present crop.

The welfare of a rapidly increasing part of our inhabitants is more or less closely associated with the pineapple industry, yet here is a condition of affairs which has obtained before in many countries and which contains within itself the factors for its own destruction from disease. The prompt application of approved methods is necessary to ward off the threatened enemy, and here again we look to science for a solution. Before these onslaughts, the individual, however hardworking, however energetic and intelligent, is absolutely helpless, without a scientific training acquired in a modern agricultural college.

Among the external influences which have been at work to accumulate the sum of knowledge necessary to success-

ful husbandry may be mentioned the development of market demands, the intensified competition among producers, the general raising of the standard of living in progressive countries, and the dissemination of education. This latter factor has acted as an especial stimulus in this direction as it has been seen that of two men endowed in other respects alike, success has followed the one who possessed the greater store of suitable learning to draw upon. With the factors alluded to at work has come the necessity of larger crop production and of more economical methods of tillage and harvesting. To assisting the enhancement of harvest yield, have come, among others, the chemist and the soil expert, who have determined the proper constituents of plant food, and the scientific plant breeder, with special knowledge of the laws determining the establishment of varieties and the evolution of new breeds. The question of economic harvesting has been very generally solved by the mechanical devices of the engineer.

It is not alone in the plant crops of the farm that this special knowledge to which we have been alluding applies, but the same is necessary to the breeder of all farm stock. With these latter, whether the object aimed at be the profitable production of horses, or sheep, or even the more lowly feathered stock, the most successful operator will be the one who has the greatest store of suitable knowledge to draw upon. The chicken breeder will have more opportunity to succeed who has the principles of Mendell's laws of heredity to assist him, than he who is groping in the dark, as must he whose lore has been learned by merely observing local conditions.

It is to be noted that the legislative appropriation to which we have alluded does not confine its operation to agricultural education alone, but embraces in its scope the wide field covered by the mechanic arts. The liberal policy of making provision for instruction in other departments of technical education is to be commended, and its influence will doubtless exercise as beneficial effect in other branches of industry as that which we anticipate in agriculture.

With the establishment of an institution in this Territory imparting a knowledge of the sciences tending to a better knowledge of the requirements of every department of husbandry, and affording a technical education in other fields calculated to fit the student for the diversified industries and means of livelihood of the islands, a new impetus will be given to the development of Hawaii. We predict a great work and future for the Agricultural College soon to be founded in our midst and wish it all success.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

PRINCIPAL CITRUS INSECTS IN HAWAII.

By JACOB KOTINSKY.

(Continued from last "Forester.")

TABLE FOR IDENTIFICATION OF COMMON CITRUS INSECTS IN
HAWAII.

This table was drawn up to aid the grower of citrus trees in identifying the insects upon them that are of economic importance. It is especially hoped that school teachers will make liberal use of it in determining citrus insects that may come their way. The table does *not* include *all* the insects that may be on citrus plants. Even as it is, some of the insects, like the snow and acuminate scales and the white-fly are, so far as known, only of local occurrence and would not have been included but for their economic importance elsewhere and the possibility of their assuming similar importance here in course of time. More detail instructions for the use of the table will follow it. It is not intended that the table should answer the purpose of absolute, unquestioned identity of the insects enumerated therein, and the student is referred to subsequent pages in the text for more detail descriptions.

Name preceded by asterisk (*) is of a beneficial insect.

Name preceded by ?* is of an insect of questionable use in orchards.

I. ON VERY YOUNG, SOFT GROWTH.

- Dark, small, soft, smooth-bodied, winged and wingless, usually
in large numbers.....*Aphis* or *Plant-lice*
Among the aphis usually.
Stationary, minute, pearly white.....**Egg of Hover-Fly*
Green maggot, pointed at mouth end, where it often holds
an aphis.....**Larva of Hover-Fly*
Miniature alligator-like insect, dark body with whitish
markings.....**Larva of 8-spotted Ladybird*
Brown, spiny grub, over twice as long as broad.....
.....**Larva of Yellow-Shouldered Ladybird*

2. ANYWHERE ON THE TREE, LEAVES, OR FRUIT.

With legs and wings freely used.

Wings four.

- Wing covers horny, shell-like insect shaped more or
less like the half of a sphere, flat side down.....**Ladybird*
Steel-blue in color.....**Steel-blue Ladybird*
Uniformly-orange**Orange Ladybird*
Red or orange, spotted with black.....**8-spotted Ladybird*
Orange, with round dark spots in lighter circles..
.....**10-spotted Ladybird*

- Black, with 2 or 3 yellow spots in front.....**Yellow-Shouldered Ladybird*
 Red, with dark spots.....**Vedalia Ladybird*
 Longer than wide, dark, orange front and rear...**"Brownie" Ladybird*
 Only front half of upper wings horny or all wings shorter than body; legs, head and snout rather long; red and dark bronze on top; moves rather slowly*?*Hawaiian Kissing-Bug*
 Wings transparent, gauze-like, folded roof-like over its body when at rest; uniformly green or brown, good-sized insect ($\frac{3}{8}$ - $\frac{1}{2}$ in. long).....**Lace-wing Fly*
 Wings transparent, either folded flat on back or in motion; insect very tiny, brown, black or brown with black markings.....**Scale Parasite*
 Wings white or yellowish, mealy, insect very small...*White Fly*
 Wings two.
 Very tiny insect, wings folded flat on back, cottony threads often project behind.....*Male of Scale Insect*
 Good-sized fly, light brown with darker markings and bronze thorax, hovering about an aphid colony or resting nearby**Hover-Fly*
 Wingless, but with legs.
 Moving rapidly when disturbed, with curved pincer-like organs in front and a pile of rubbish on its back.....**Larva of Lace-wing Fly*
 Moving slowly, spiny, pale yellowish...**Larva of Steel-blue Ladybird*
 Moving slowly when disturbed, covered with very white, conspicuous, waxy filaments.....**Larva of "Brownie" Ladybird*
 Moving slowly, reddish, usually on cottony cushion scale...**Larva of Vedalia*
 Oval, convex, reddish, with yellow or white fringe about margin.....*Young Cottony-cushion Scale*
 Very tiny, yellow or purple, more or less mealy...*Young Scale Bugs*
 Without wings or visible legs.
 A dark-brown batch, sticky to the touch, whitish on top, usually on leaf.....*?*Egg-batch of Hawaiian Kissing-Bug*
 Yellowish batch of eggs standing on end, 6-12 in batch, usually on leaf.....**Eggs of 8-spotted Ladybird*
 Tiny, green egg at end of slender rod, the other end of which is fastened to the leaf.....**Egg of Lace-wing Fly*
 Pearly sphere, size of small, mourning pin-head, fastened to leaf.....**Pupa of Lace-wing Fly*
 Brown, gray or black organism of indefinite shape, with or without spines, occurring singly or several together, fastened to the leaf.....**Pupa of Ladybird*
 With leathery or horny cover.....*Scale Bug*
 Scale horny, circular, convex, dark.....*Florida Red-Scale*
 Scale as above, but reddish, insect adheres to scale when latter is raised.....*Orange Red-Scale*
 Scale mussel-shell shaped, brown, distinctly keeled lengthwise, male scales numerous, white.....*Snow Scale*
 Scale as above, but *not* keeled, more or less comma-shaped, shape and color of male scale same as female, only smaller.....*Purple Scale*
 Scale somewhat elongate, but with parallel sides, central portion black.....*Mediterranean Scale*
 Scale elongate with parallel sides, less than $\frac{1}{25}$ in. long, pale yellow.....*Pupa of White-Fly*

Scale triangular, greenish when fresh.....	<i>Acuminate Scale</i>
Covering cottony, sack containing insect globular, yellowish.....	<i>Globular Mealy Bug</i>
Long, white, fluted cottony-sack at rear end of insect, which appears to stand on its head.....	<i>Full-Grown Cottony-Cushion Scale</i>

HOW TO USE THE TABLE.

Following the table it is not impossible to locate the names of most of the insects therein without the use of instruments. In the case of some of the insects, however, it is absolutely essential to resort to mechanical aids. These are of a very simple character and inexpensive. A pocket lense, the first requisite, may be secured in any optical or photo-supply establishment for from 50 cents upwards. The uses of a pocket lense are so numerous these days, especially to plant breeders and teachers, that none should be without it. The use of the lense and what observations one can make with the aid of it are an education of no inconsiderable merit. If the insect is active a small vial with a cotton or cork stopper, or a glass with a cloth or paper cover, will be found convenient. A penknife or pin is the other requisite, and the laboratory is complete. Armed with these two simple implements one can readily determine some of the finer points of structure that had to be drawn upon for differentiation between closely-allied species. An insect that is normally active, but stationary at the moment of observation, can be induced to move with the touch of pin or penknife point. One that is normally stationary, however, will fail to respond to the hard point, and thus be thrown into another portion of the table.

Indentures are used for the various groupings, so that when the appearance of an insect does not correspond to the description given in a certain line, we turn to the next line that is the same distance from the margin. For example. Suppose we have before us the larva of the yellow-shouldered ladybird, but do not know what it is. We turn to the table, where the first line reads: "1. On very young, soft growth." Yes, we say, there is where we found it. The next line reads: "Dark, small, smooth-bodied, winged and wingless, usually in large numbers." Now, our insect may, after a fashion, answer to the entire description, but we did not find it in "large numbers," hence we proceed to the next line. "Among the aphids usually." Yes, we found it "among the aphids." The next line begins, "Stationary," but we have ascertained after brief observation that our insect is *not* "stationary." It is not the next one because it is *not* "green." Nor is it the next one, because it is scarcely "alligator-like," and bears *no* "whitish markings." We find the next line to read, "Brown, spiny grub, over twice as long as broad," a description that corresponds fairly

with the insect in hand. But to be more certain of our identification, we will look beyond (in subsequent number of the "For-ester"), under the heading "Yellow-shouldered Ladybird," and there find a more detail description of the insect. The asterisk before the name in the table points to the fact that the insect is useful, it feeds on place lice, and hence deserves our protection.

One not accustomed to the use of such tables will, of course, experience some difficulty in the beginning. A little practice will, however, soon make one proficient in its use, and the persevering will probably find it even fascinating to be able to exclaim, "Eureka!"

(*To be continued.*)

BOARD OF AGRICULTURE AND FORESTRY.
Division of Agriculture.
CASSAVA.

Much attention has recently been given to the development of cassava cultivation in subtropical and tropical regions. The food value of the plant has long been known. It has probably reached its highest development in the West Indies, Brazil and other South American countries, as well as Java and India, where long cultivation and selection have evolved a large number of cultural forms or varieties. Cassava is well known to the native Hawaiians as a food plant, and now bears the name of *Pia*, which was by the older generation applied only to the native arrowroot (*Maranta arundinacea*). Cassava is one of the chief food plants of the West Indies, taking the place there, and in other tropical lands, of the Irish potato in colder climates.

In the Southern States cassava has within the present decade received much attention as a forage crop for feeding and fattening hogs and cattle. It is used on a large scale on at least one of the larger ranches in Hawaii, and is rapidly acquiring high value in the estimation of those who have tried it.

A third use for this important food and forage plant, and one which promises to vastly increase the area of cultivation, is the utilization of its fleshy roots in the manufacture of starch, glucose and dextrine.

The commercial starches used for glucose and dextrine manufacture have been chiefly corn and potato. Corn and corn starch have been rising in price because of the increasing number of uses for this grain. The statement has been made that corn cannot profitably be used as a source of starch when it is worth more than 45 to 50 cents per bushel in Chicago. The tendency of the prices of both corn and potatoes is bound to be upwards, with the continued and rapid increase in population in the United States and the consequent diversion of corn and corn products to

use as food rather than industrial manufacture. Important as starch is as a food product, the greatest market for it has been and probably will continue to be the cotton cloth, paper and other similar manufacturing industries. If potato starch and corn starch are to find increasing consumption as human food, thus forcing up the price, the textile industries must seek other starches which can continue to be produced at a low cost.

Cassava starch, or, as it is commercially called, "Tapioca flour," has hitherto been produced only on a small scale and by comparatively crude methods. It has not competed with corn or potato starch because of high cost due to crude methods of manufacture. The quantity annually offered for sale has also been small and too variable to create a standard of comparison with the other starches offered in enormous amounts.

Considerable impetus has been given to the manufacture of starch from manioc within the last few years. The industry has become established on a sound business basis in Florida and in Jamaica.

There is one starch factory in operation on Kauai, but the plant is not modern, and the business is conducted rather as an adjunct to cattle feeding, the intention being to utilize some of the surplus not required for stock food to supply laundry starch for sale in the local market.

An average of something more than 100 analyses of the fresh cassava roots shows from 25% to 27% of starch and from 4% to 17% cane sugar, the latter, however, more often low than high. For every 100 pounds of root there are approximately 27 pounds of starch and four pounds of sugar. By the process of crude manufacture in vogue among the Chinese, who were the first to produce starch in Hawaii, the amount recovered is seldom more than one-half of the total starch in the root. A maximum approximating twenty pounds is obtained in the Florida factories. An improved method of manufacture is now being adopted in the West Indies by which almost all of the starch in the root may be recovered, the average amounting to 25 pounds out of a possible total of 26 to 27 pounds present.

The earliest method used for accomplishing fine division of the pulp and the rupturing of the root cells to permit the escape of their contained starch grains was to grind or crush the roots, run the crushed mass into tanks with water and allow it to ferment. During the fermentation process the lactic and acetic acids formed disintegrated the cellulose and broke up the cells, allowing the starch grains to escape. After several days' fermentation, the mass was repeatedly washed to recover the starch. This method was extremely wasteful as well as unhygienic, and has long been discontinued.

The method of starch extraction universally used up to 1903 has been, in brief, as follows: The roots are washed, peeled and grated. The pulp flows over long sieves placed on an inclined

plane and is acted upon by streams of water. These sieves are subjected to interrupted lateral motion, so that the wet pulp is shifted about and constantly subjected to the jets of water thrown upon it. On this account the batteries of sieves are known as "shakers." The starch milk which passes through the sieves flows into vats or tanks, where the starch is repeatedly washed to separate out the impurities. It is either allowed to settle in tanks or, in some factories, is concentrated by means of vacuum pans without heat. It then goes through further washings and is treated with dilute alkalies—processes the object of which is to purify and bleach the product and create uniformity of grade. The purified starch is finally kiln-dried with dry air and is ready to pack in barrels for export or home consumption. The pulp which flows from the lower end of the sieves is either treated as a waste product or is dried, pressed into bales and used for cattle feed.

In Florida this dried pulp is said to have a value of \$10 to \$12 per ton, but far more has been produced than could be utilized. This waste pulp contains at least 20% and often 25% to 30% of all the starch that was in the root.

In the "shaker method" of starch manufacture the extraction depends upon (a) the fineness to which the pulp is ground or grated and (b) the thoroughness with which the pulp can be washed. It has been unfortunate that the machinery used in cassava factories has been in most cases adapted from forms first invented for other lines of manufacture. Cassava starch grains are very minute, approximating those of corn rather than potato. The pulp graters used for cassava were modified either from potato graters or from sugar beet pulpers. Potato starch grains are very much larger than cassava, and it is needless to mention that the extraction of soluble sugar from beet pulp is quite unlike removing solid starch grains from their station in the plant cell. It is difficult to bring about a sufficiently fine subdivision of the root tissues so that each cell shall be ruptured permitting its starch grains to escape. A certain amount of starch is bound to remain. This starch residue in the pulp may represent the profit of manufacture, so that unless a market can be created for the waste there may be too narrow a margin of safety between profitable and unprofitable manufacture.

The manufacturers of corn starch, on the contrary, starting as they did with a hard and flinty seed as the source of their product, rather than a fleshy watery root, used the ordinary flour milling machinery as the basis of evolution for their special machinery. Manufacturers of corn starch use a burr-stone modified for treating wet grain. Obviously, the corn pulp is thus at the start in a much more finely-divided condition than the cassava or potato pulp produced by saw-tooth graters. The corn starch manufacturers save practically all of the starch in the corn kernel.

The new method of manufacturing starch from cassava roots

borrowed from the corn starch side of the industry, the burr-stone of the flour miller, modified for the treatment of wet grain, to grind the root so that the ultimate cells of the root are ruptured and torn apart.

The second improvement is the adaptation of machinery used in the extraction of precious metals from free milling ores. The principle on which this works is that the rate of motion of bodies falling freely in a fluid varies in accordance with the ratio of their specific gravity to that of the fluid. The amount of friction developed varies with the size of the particles. If particles of equal specific gravity, starch grains for instance, fall through an upward-moving column of water, the fluid exercises a weighing capacity, so that the starch grains, which are of uniform specific gravity and equal size, are separated from the particles of cellulose and fiber constituting the bulk of the mass of the finely-ground cassava roots.

The finely-ground cassava pulp, falling through a vertical pipe into a conical separator constructed somewhat on the principle of an ore separator of the above type, is met by an ascending current of water which carries the starch grains upwards through a wire gauze diaphragm, while the cellulose and fiber remain within the cone. When the charge of pulp is exhausted it is discharged automatically through the bottom of the cone and is ready to be freed from its water, dried and baled for stock feed.

The impure starch milk flows from the upper part of the separator, and is conducted to iron settling tanks with conical bottoms. The milk flows down a tube to the bottom of the cone. It then ascends in the increasing sectional area of the cone, in which the liquid suffers reduction of velocity. The downward motion of the starch grains overcomes the upward motion of the fluid, which continually flows away as dirty water through a pipe in the upper part of the vessel, while the starch in a highly-concentrated state is continually drawn off through a valve in the bottom of the cone. The concentrated starch milk is then treated with alkali, washed in shakers and run through a final battery of purifying cones. The purified starch milk is run into vats and the starch kept in suspension by means of agitators. From the vats the milk runs into wooden boxes with perforated bottoms, lined with muslin. These boxes are placed in a vacuum chamber and the water extracted. The solid blocks of starch are then cut, wrapped in paper and placed in a drying kiln, from which the starch comes out as a marketable product.

To make tapioca, the starch blocks taken from the boxes are crushed and placed in a steam-jacketed cylinder and the steam turned on. The heated starch grains burst, causing the starch to assume the well-known form of tapioca.

Where cassava is to be used in the manufacture of glucose the

whole of the ground pulp is pumped direct to the converters, and the process of manufacture is the same as for corn or beet pulp.¹

CULTIVATION.

Cassava grows in Hawaii as a perennial, although commercially it is best to treat the crop as an annual. It thrives at sea level on the kona side of most of the islands, and up to 3000 feet in all, except the very wet, districts on all of the islands. Cassava requires about the same soil as the sweet potato and maintains an existence for a surprisingly long time under the worst conditions of neglect, even when overgrown by lantana and other weeds. A few plants are usually to be seen in the kuleanas of the native Hawaiians, who give it even less care and attention than they bestow on their sweet potato crop.

If the cultivation of this crop is to be undertaken on a commercial scale, land should be selected which can be plowed. Shallow plowing (6 to 12 inches) is to be recommended rather than deep (12 to 30 inches), in order to keep the roots near the surface and facilitate harvesting. After the land is plowed and harrowed, furrows are thrown 4 to 5 feet apart. The seed, consisting of cuttings of the stalk of the plant 3 to 8 inches long, are dropped in the furrow, two to a hill, 2 to 4 feet apart in the row. The seed is then plowed under. The best results have been obtained here in Hawaii from plantings made from November to February. The field should be hoed twice, or, better, the soil stirred and weeds kept in check by running a one-mule cultivator between the rows. By the end of the wet season the plants will be high enough to keep ahead of the weeds and the crop may be laid by.

No irrigation is required. A moderate application of a low-grade complete fertilizer such as would be used for any other crop of low value (compared with cane) is recommended. Hawaiian soils are mostly lacking in potash, so that this element should be used rather freely.

HARVESTING THE CROP.

The roots from seed planted in January may be harvested the following October or November. The roots will remain for a long period in the soil and if allowed to grow for two years will greatly increase in size and weight, but somewhat at the expense of starch. Two-year-old roots are often hard and fibrous, containing little starch. Cassava roots rot very quickly after being dug, and can seldom ordinarily be kept for over a week. However, as long as they remain in the ground they do not rot unless the plants are diseased. Old roots and old stems are often infested to a greater or less extent by borers. Mice and the field cockroach destroy the roots. Because of the wastage through the

work of mice and insects it would not be advisable to treat cassava commercially as other than an annual in Hawaii.

MEANS OF REMOVING FROM THE GROUND.

As the roots are of considerable size, often from 3 to 4 feet in length by 2 or 3 inches in diameter, and as they grow in clusters of from four to eight on each stalk, a single cluster often weighing from 20 to 30 pounds, the digging cannot be done with a plow, as sweet potatoes are dug, but must be done by hand. The original section of seed cane which was planted does not decay when growth begins, but continues to live and grow through the entire season, the new stalk usually growing from one end and the cluster of roots from the other. The piece of seed cane which was planted thus becomes what is called the "union" between the stalk and roots of the new plant. When the stalks are cut, either for seed canes or to clear the land for digging, a stub 5 or 6 inches high is left to show the position of the roots and to furnish a hold for pulling them from the ground.

IMPLEMENTS USED IN DIGGING.

Various tools are used in digging, and sometimes, especially when the soil is very light and the root growth is small, the work is done by simply grasping the stub with the hands and pulling the roots, without the use of any tools. This method answers very well on light soil and when only a few roots are gathered daily, but where the soil is of fair quality, and where any great amount is to be gathered, some simple tool is of great assistance. Some growers use a grubbing hoe, pushing the blade into the ground under the union and then alternately pulling and prying until the roots are so loosened that they can be lifted out. Others use a cant hook, such as is used in handling logs, pushing the hook under the union and then lifting the cluster of roots from the soil. Still others use pinchers much like large blacksmith pinchers, but with the end of each handle turned into a ring for a hand hold. The user grasps the stub with the jaws of the pinchers and then pulls and shakes the root cluster until it is loose from the soil.

Where considerable quantities of the root are to be dug, an implement called a "lifter" is very commonly used. This lifter is simply a straight piece of wood about 8 feet in length and 2 inches in diameter, with a V-shaped hook about 2 feet from one end. The hook is of iron or steel, and can be made by any blacksmith from an old file or a piece of a wagon spring by bending it edgewise, so as to make the opening from 5 to 6 inches in length and about 2 inches in width at the open end. Two holes are punched through one arm, so that it can be bolted to the

wooden handle, and the inside edges are beveled from below, so as to make them sharp. This hook is bolted to the handle in such a position that the inner edge of one arm is about an eighth of an inch outside the side of the handle, and usually on the right-hand side as a matter of convenience. The opening of the hook is toward the long end of the handle, and the lifter is used by catching the hook over the stub and then lifting and shaking the roots until they are free from the soil. The short end of the lifter, which rests on the ground, is sometimes finished off by bolting to it an old spade blade or some other piece of iron of a similar shape to give a broader rest, which will prevent the end of the lifter from burying itself too deeply in the soil and which is also very convenient for chopping off weeds or other obstructions and for a little digging, which is sometimes needed. The arms of the hook should be from $1\frac{1}{2}$ to 2 inches in width, and the handle should have a little additional size where the bolts pass through, as both hook and handle are under a considerable strain when lifting heavy roots from a compact soil. The cost for digging will depend on the yield, but will not be far from \$1 per ton.²

A yield of five tons of cassava roots per acre is perhaps above the average, taking into consideration the whole area cropped, but yields of from five to eight or ten tons may be counted on in good land with favorable seasons. When the yield is much under five tons there is little profit in growing the crop for starch or glucose, but the roots are good feed, especially for cattle. It would seem that the cultivation of cassava for starch or glucose manufacture might well be carried on in connection with the fattening of cattle and hogs for market.

The area available for the cultivation of cassava in Hawaii is very large. It is a crop which does not require large investment for the purely field operations of plowing, planting, cultivating and harvesting the crop. So far as recorded, cassava has never been grown under irrigation and does not require it; in fact, on the contrary, it is often stated that irrigation is detrimental. It has also been extensively grown without the use of fertilizers, although where large plantings are to be made for the purpose of converting the product into starch, glucose or cassava meal, the use of fertilizers and more cultivation will undoubtedly prove profitable.

If cassava is to be grown for starch production, the common practice of all other countries where this crop is cultivated indicate that the roots should be harvested not later than nine or ten months after the seed is placed in the ground.

In Jamaica³ the average cost of cultivation of cassava is estimated at about \$20 per acre, excluding rent, taxes, interest and

²U. S. Dept. Agriculture, Farmers' Bulletin No. 167.

³Bul. Dept. Agric. Jan. 2, 1903.

management, and eight tons per acre is considered a usual yield. The statement is made that where dry meal is made from the roots for shipment to glucose factories in England, the Jamaica growers receive a profit of from \$34 to \$44 per acre, and that there is a profit of from \$40 to \$50 per acre where the fresh roots are sold to starch factories, at \$10 per ton.

The average yield per acre in Florida is less than in Jamaica, four to six tons, and the factory price of the roots is about the same. Hawaiian conditions of soil and climate are more similar to those of the West Indies than Florida. Our soils are richer and the growing season continuous, so that the yields per acre will average above those obtained in Florida.

The size and capacity of a starch or glucose factory will govern the cost of production. A factory capable of turning out 10,000 tons of starch per annum can be operated more cheaply than ten factories of 1000 tons capacity. However, the size of factories will depend on the areas that can be devoted to this crop.

The yield of starch per acre from cassava can be counted on to average 50% greater than from corn. At an average yield of five tons per acre, which is probably lower than the average in Hawaii, the yield of starch would amount to 2500 pounds. At eight tons of roots per acre, the yield should be 4000 pounds. If the fresh cassava roots are utilized in the manufacture of glucose instead of starch, the product should be about 30% of the weight of the roots, or 3000 pounds of glucose from five tons of roots, or 4800 pounds from eight tons. The cost of glucose manufacture is less than of starch manufacture, in that it requires a smaller investment for buildings and plant. Commercially, glucose is sold in barrels of about 600 pounds weight. Its average value is about 1 cent less per pound than for raw sugar. San Francisco prices from 1893 to 1905 have ranged from $2\frac{1}{2}$ to $3\frac{1}{4}$ cents per pound. The lower price received for glucose and the larger investment required for the manufacture of starch make the total value per acre about the same, whether the cassava roots are converted either into glucose or starch. At $2\frac{1}{2}$ cents per pound for glucose and 3 cents per pound for starch, the product from an acre of cassava would be worth about \$75 for a five-ton yield and about \$120 for an eight-ton yield. Sulphuric acid, which is used in the manufacture of glucose, is now being manufactured in Honolulu and can undoubtedly be figured at as low a price as on the mainland. The third alternative would be to mill the fresh roots without attempting to separate the starch, dry the crude meal and ship it to the mainland markets for the production of glucose there. The advantage of this would be that very much less capital would be required than for the manufacture in Hawaii of either starch or glucose.

The starch which is now being manufactured in Hawaii by the crude Chinese methods, with very simple machinery, has not

proved to be salable in large quantities at a sufficiently high price to make the industry profitable. A certain amount of crude pia starch is consumed in the local market; shipments have also been occasionally made to San Francisco and New York. As stated above, the cotton spinning industry is the chief consumer of starch. Cotton threads must be treated with a "size," made from starch or some other cheap material of similar properties, before the threads can be woven. The function of the size is to fasten down the loose ends of the cotton fibers so as to make the thread of uniform smoothness. Manufacturers of cotton goods use a formula requiring starch of a certain density and chemical reaction. Some manufacturers use only alkali starch, others require acid starch. The alkalinity or the acidity of the starch depends on whether alkalis or acids have been used in the bleaching and purifying processes. Starches prepared by the crude Oriental or Chinese methods lack uniformity and are neither markedly acid nor alkaline, so that unless the product is offered in large enough amount so that it will pay the manufacturer of cotton goods to adapt his formulas to starch of this neutral character, the crude starch prepared in this way must be sold at less than the customary market prices. In other words, products must conform to market standards if they are to command the market price. If Hawaii can produce an alkali or an acid starch comparable in quality with the starches produced in other countries the market should be unlimited.

JARED G. SMITH.

*THIRD REPORT OF THE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY OF THE
TERRITORY OF HAWAII, FOR THE YEAR ENDING
DECEMBER 31, 1906.*

The above report has recently been issued and has been widely distributed throughout the Territory. It contains a comprehensive account of the various divisions of the board for last year.

DIVISION OF FORESTRY.

The personnel of this division has been substantially the same as last year, Mr. Ralph S. Hosmer continuing as superintendent. During the summer Mr. C. S. Judd of the School of Forestry at Yale University was associated with this division, his work centering at Lihue, Kauai.

Seven new forest reserves have been established during the year, containing an area of upwards a hundred and twenty-five thousand acres. The Territory now possesses twelve reserves of a total area of over a third of a million acres. Upon the suggestion of the Superintendent of Forestry, the Commissioners have included in the recommendation for appropriations a sum

sufficient to establish a ranger service throughout the reserves. Although only a small force can at present be secured, it is hoped that the necessity of this service will in future permit of enlargement.

During the year the policy of forest extension has been actively pursued, both in assisting the establishment of plantations and in the distribution of trees and seeds. Experiments have also been continued in the cultivation of rubber-producing trees, and tests made to ascertain the best conditions for their growth. No serious fires have been reported during the year.

DIVISION OF ENTOMOLOGY.

This division continues under the charge of Mr. Alexander Craw, Messrs. Koebele and Kotinsky being consulting and assistant entomologists respectively. Mr. G. A. Jordan has succeeded Mr. C. J. Austin as assistant inspector, and Brother Matthias Newell has been appointed inspector for the port of Hilo.

Much important work has been done in rigorous inspection of freight, and through timely action the Territory has been spared the importation of many obnoxious pests. Through the courtesy of the Federal officials a fumigating apparatus has been installed at the Honolulu postoffice for the chemical treatment of imported mail matter. Fumigatories have also been established at the Hilo dock and postoffice, and three others on various Honolulu wharves. The division is therefore well equipped for treating shipments.

The work of breeding and distributing beneficial insects has progressed successfully and special attention has been paid to establishing enemies of the horn fly, the avocado pear scale and of cut worms. The diminution of the horn fly will be much appreciated by the island cattle breeders.

Numerous changes in the buildings at the Nursery have facilitated the scientific work of the division. The installation of a modern equipment for microscopic study and of photographic apparatus will assist materially in this department of the work.

DIVISION OF ANIMAL INDUSTRY.

Dr. V. A. Nørgaard has continued superintendent of this division, assisted by Dr. J. C. Fitzgerald. Dr. Elliot has officiated as animal inspector at Hilo. Much of the year's work has been occupied in inspecting animals imported to the Islands. Those affected with suspicious symptoms are treated at the quarantine station at Kalihi, where facilities for a proper examination are at hand.

Various visits have been made to the different islands to definitely determine the prevalence of glanders, which is the most serious disease affecting horses in the Hawaiian Islands. The

most efficient way to stamp out the disease is by slaughter of the affected animals. Difficulties are encountered in this respect because of the inclination of many of the Oriental owners to hide animals showing indications of the disease.

Much attention has also been given to the eradication of "Scabies," and satisfactory progress has been made in the control of this disease. Owners of dogs will take much interest in the efforts made tending to the destruction of the insidious heart-worm of these animals.

The availability of the services of the Territorial Veterinarian, by the stock owners and others who may require his advice, has been made use of and much assistance has been given in this direction.

DIVISION OF AGRICULTURE.

Mr. Jared G. Smith, Director of the Federal Agricultural Experiment Station, has been in charge of this division, which has devoted its experiments largely to continuing its work in establishing the tobacco industry in Hawaii.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Mr. Hosmer's report to the Commissioners enters fully into the work of the division for the year. A noteworthy feature is the introduction of a series of maps of the various islands which graphically illustrate the forest reserve system which has been established. The Hawaiian reserves consist of three classes of land, viz.: government land, not leased; leased government land; and land in private, fee simple ownership. The report contains many carefully-prepared tables analysing the lands of the various islands under the above classes.

To permanently mark the forest reserve boundaries, metallic monuments have been established, consisting of two galvanized iron pipes, each $4\frac{1}{2}$ feet long and $2\frac{1}{2}$ and 3 inches, respectively, in diameter. The smaller pipe is set in the ground; the larger one, fitting over it, is secured by a bolt fastened by a brass railway switch padlock. The upper pipe carries a metal target, with the letters: F. R. T. H. (Forest Reserve, Territory of Hawaii). When set in place the monument is given a coat of white enamel paint. The detachable upper pipe permits the use of the point as a station in survey work. During 1906, sixty-nine of these monuments have been established.

The collection of seed of all the more important native and introduced trees has been systematically carried on for selling at very moderate prices. An important development has taken place in the introduction of the seed of new and little known exotic plants. The introduction of new trees is one of the most important lines of work yet to be taken up in Hawaiian forestry.

In compliance with the appropriation for experimenting in growing rubber trees on Government forest lands, and in response to a general demand for information upon questions of rubber cultivation, systematic work has been carried on in this work during the year. The most important question in connection with the establishment of the rubber industry in the Islands is whether the trees will yield rubber in commercial quantities. This is, of course, the vital point to be determined, and until it has been demonstrated satisfactorily the industry must remain in an experimental stage. The existence in the Islands of two groves of Ceara rubber trees of a sufficient size for tapping is very fortunate, and experiments will soon be conducted under the joint direction of the Division of Forestry and the Federal Agricultural Experiment Station to determine the production of lac.

One of the important events of the year relating to forest work near Honolulu has been the progress towards the acquisition by the Territory of the Coney Estate property on Tantalus, upon which is the largest part of the eucalyptus forest.

During the year several publications have been issued by the division which have been widely circulated.

An interesting feature of 1906 has been the organization of two koa lumbering companies on the Island of Hawaii. Actual work has not yet commenced, but both companies have commenced preliminary steps for logging in the near future.

During 1907 it is intended actively to pursue the policy already laid down in the past year. The creation of forest reserves will continue until the chain of projected reserves is established. Coöperation with private owners will also be undertaken in tree planting and in stimulating the movement where it already exists.

REPORT OF FOREST NURSERYMAN.

Mr. Haughs submits a lengthy report upon the work at the Government Nursery, the Nuuanu Station and the Tantalus Forest. Extensive assistance has been given to private owners in the matter of growing and caring for trees. Much valuable information has also been imparted to visitors who have come to the Nursery for advice. Nineteen special visits have been taken to outside points at the invitation of private persons for the purpose of consultation as to establishing a system of tree planting. In each instance plans have been made to fulfill the requirements of the particular case.

Following Mr. Haughs' report are the minor ones of the District Foresters. These together occupy nearly fifty pages.

The report of the Librarian concludes the part of the publication relating to the Division of Forestry. The use of the library room for the meetings of other organizations has been largely

resorted to, and altogether forty-eight evening meetings have taken place during the year. From this use, the Board gains the advantage of bringing the public in touch with its diversified work.

DIVISION OF ENTOMOLOGY.

Mr. Alexander Craw's report describes in detail the precautionary measures which have been taken to exclude insect pests from the Territory. Descriptions are also given of the local inspection work and the steps which are being taken to exterminate pests which have already asserted themselves. Noteworthy among these are the mango weevils and scale insects.

The introduction, breeding and distribution of beneficial insects has been in charge of Mr. Jacob Kotinsky, under whom admirable work has been done. By far the largest and most numerous consignments of beneficial insects were enemies of the horn flies. Enemies of scale bugs, plant lice and army worms also are described and appropriately illustrated. Time alone will show the result of the release of these various insects. This result, however, it is satisfactory to know, can only either be positive or neutral, depending upon whether or not the insects establish themselves and how rapidly they increase. No evil effects need be apprehended, because all those released are either predaceous or parasitic, and no insect has been known to abandon a carnivorous for vegetarian diet.

The beneficial insects have been sent by Mr. A. Koebele from California and Arizona, by Mr. E. M. Ehrhorn, also from California, by Mr. F. Muir from Fiji, and by Mr. G. Compere from China and Japan.

Mr. Koebele's report is appended to that of Mr. Alexander Craw's. It contains field notes on enemies of the alligator pear scale, horn fly and other insects sent to Honolulu throughout the year.

DIVISION OF ANIMAL INDUSTRY.

Dr. Nørgaard's report will be found of particular interest to breeders of the different classes of live stock. The regulations governing the importation of animals have proved effective and the local representative of the United States Bureau of Animal Industry in San Francisco has signified his willingness to inspect all stock intended for shipment to the Islands. The great value of this assistance will be the prevention of shipment of affected animals, which will greatly reduce the danger of the importation of disease.

Various animal diseases are described, their occurrence in the Islands reported, and steps for control explained.

A new branch of investigation is now being conducted by the division. The great difficulty of keeping valuable dogs immune from the heart worm prevalent in the Islands has rendered the matter sufficiently important to receive special attention. The worm is transmitted by means of mosquitoes, and as yet no remedy has been discovered to alleviate the sufferings of affected animals.

DIVISION OF AGRICULTURE.

Mr. Jared G. Smith in his report shows in what manner the Territorial appropriations have been expended for this branch of the work. The tobacco field experiments have been so far successful that it does not seem necessary to continue them on a large scale, but many points connected with curing, fermenting and sorting of tobacco require further investigation. It is now proven conclusively that a tobacco of good burning qualities, texture, flavor and color can be produced on a commercial scale and at remunerative profit.

The work with Bluefields bananas has been conducted. One thousand suckers have been distributed and the plants are now so widely circulated that their propagation by the Station on a large scale is no longer necessary.

The Station has also successfully conducted a demonstration of the fact that papaias and alligator pears can be shipped to the mainland without loss in transit, and that a market for \$500,000 of these fruits is waiting the Hawaiian grower. This part of the work has been performed by Mr. Higgins, who has made an extensive study of market conditions on the Pacific Coast.

(The above publication, consisting of 212 pages and illustrations, can be obtained free by application to the Mailing Clerk, Box 331, Honolulu, Hawaii.)

A MODERN AGRICULTURAL COLLEGE.

We have received a most attractive syllabus from the Department of Forestry of the Iowa State College. The publication is excellently illustrated and is a very useful guide as to the scope of the work of an agricultural educational establishment equipped with modern facilities and presided over by men actuated with the spirit of modern science. The College is now engaged in the construction of a new building specially devoted to the science of agriculture. The object aimed at by the Division of Agriculture of the College is to furnish a good foundation from which a student may become either a successful practical farmer or may develop into a specialist in any one of the branches of agricultural industry. Agronomy, the science of the field and its crops, including the study of soil, farm crops and agricultural engineering,

is essentially the main domain of the tiller of the soil, and will constitute a special department of the Division of Agriculture. The Department of Animal Husbandry, embracing everything pertaining to the judging, selection, breeding, feeding, development, care and management of various breeds of domesticated animals, will also undertake the special work outlined above. The Department of Horticulture and Forestry will offer excellent opportunities for the observation and study of these branches of agriculture. For this purpose 5000 square feet of greenhouses and forty acres of orchards and gardens are in cultivation, enabling the student to observe varieties, modes of culture and the adaptability to local soil and climatic conditions. The work of the Dairy Department is designed to give a knowledge of the science and practice of dairying. The course will fit students to become instructors, investigators and inspectors, managers of dairy establishments, cheese factories, creameries, market milk plants and condenseries. It will cover the economic production of milk and the processes relating to the marketing of butter. Attached to the division will also be an Agricultural Experiment Station to investigate questions having a practical relation to successful agriculture. The experimental investigation will involve the study of various fodders, grasses and grains, the methods of their cultivation and improvement, the moisture and fertility of the soil, the feeding of domestic animals, the problems of butter and cheese making, bacteriological investigation, fruit growing, spraying, fertilizing and pruning. A course of veterinary medicine will also afford opportunities for the study of anatomy, pharmacy, bacteriology, histology and pathology, in relation to the comprehensive science of agriculture. A full course at the Iowa State College should be of inestimable worth to a youth purposing to engage in the practice of any one of the various branches of husbandry. The State of Iowa is by no means alone in the facilities which it offers to the prospective farmer, and in its recognition of the importance to the welfare and stability of the country of this member of the body politic.

THE NEW LAWS.

Following the policy of keeping its readers in close touch with events of agricultural interest in the Territory, the Forester begins this month to print the Acts passed at the present session of the Territorial Legislature that have to do with agriculture in one or another of its many phases. Editorial comment on certain of the new laws may be looked for in subsequent issues.

BY AUTHORITY.

ACT 4.

AN ACT

TO AMEND SECTION 379 OF CHAPTER 28 OF THE REVISED LAWS OF HAWAII, AS AMENDED BY ACT 65 OF THE SESSION LAWS OF THE TERRITORY OF HAWAII, PASSED BY THE LEGISLATURE AT ITS REGULAR SESSION OF 1905, RELATING TO THE BOARD OF AGRICULTURE AND FORESTRY.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 379 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of the Territory of Hawaii passed by the Legislature at its regular session of 1905, is hereby amended so as to read as follows:

"Section 379. The Governor may, with the approval of a majority of the Board, after a hearing or hearings as hereinafter provided, from time to time set apart any Government land or lands, whether under lease or not, as forest reservations, provided, however, that on lands under lease the reservation shall not take effect until the expiration of the existing lease, or in any way affect the rights acquired under the lease. Any land or lands while so set apart shall not be leased or sold by the Government or used in any way for any purposes inconsistent with this Act; provided, however, that the Governor may from time to time, with the approval of the Commissioner of Public Lands, after a hearing or hearings as hereinafter provided, revoke, modify or suspend any and all the orders and proclamations, or any part thereof, which set apart such lands."

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 5th day of March, A. D. 1907.

G. R. CARTER,

Governor of the Territory of Hawaii.

ACT 5.

AN ACT

TO ENCOURAGE DIVERSIFIED INDUSTRIES.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. For five years from and after January 1, 1908, all property solely and actually used in the production of grapes for the manufacture of wine for commercial purposes shall be exempt from property taxes, but such exemption shall be allowed only to any person, firm or corporation in respect of land in actual vine

cultivation, not exceeding twenty acres in the case of any one holding, or to the extent of twenty acres where any holding exceeds twenty acres.

In order to secure such exemption the land in respect whereof such exemption is claimed must be fenced and actually under cultivation prior to the first day of January of the year in which such exemption is claimed.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 11th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 24.

AN ACT

TO ESTABLISH THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF THE TERRITORY OF HAWAII, AND TO PROVIDE FOR THE GOVERNMENT AND SUPPORT THEREOF.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. The Governor shall nominate and by and with the advice and consent of the Senate shall appoint five persons, who shall constitute the Board of Regents of the College of Agriculture and Mechanic Arts of the Territory of Hawaii, which is hereby established.

Section 2. The persons appointed in accordance with Section 1 of this Act shall be residents of the Territory of Hawaii and not less than 25 years of age. One member of the Board of Regents shall be appointed for the term of one year, two for two years, and two for three years, and their successors shall thereafter be appointed for the term of four years.

Section 3. The Board of Regents shall have the general management and control of the affairs of the College. They shall have power to purchase or otherwise acquire lands, buildings, appliances and other property for the purposes of the College and expend such sums of money as may be from time to time placed at the disposal of the College from whatever source. All lands, buildings, appliances and other property so purchased or acquired shall be and remain the property of the Territory of Hawaii, to be used in perpetuity for the benefit of the College.

Section 4. The purposes of the College are to give thorough instruction in agriculture, mechanic arts and the natural science connected therewith, and such instruction in other branches of advanced learning as the Board of Regents may from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in

each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto.

Section 5. No person shall, because of age, sex, color or nationality, be deprived of the privileges of this institution.

Section 6. The Faculty of the College shall be under the direction of a President, who shall be appointed by the Board of Regents. The members of the Faculty shall be likewise appointed.

Section 7. The official name of the Board of Regents shall be Board of Regents, College of Hawaii, and the Board shall adopt and use a common seal, by which all official acts shall be authenticated.

Section 8. The Board of Regents shall have the authority to sue in its official name and shall be subject to be sued only in the manner provided for suits against the Territory of Hawaii.

Section 9. The Treasurer of the Territory is hereby authorized to pay from time to time to the Board of Regents, upon their receipted vouchers, such sums as may be available. The Board of Regents shall cause to be kept suitable books of account and shall submit to each session of the Legislature a statement showing the total receipts and expenditures.

Section 10. This Act shall take effect from and after the date of approval.

Approved this 25th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 104.

AN ACT

TO PROVIDE FOR THE PROTECTION OF BIRDS BENEFICIAL TO THE
FORESTS OF THE TERRITORY OF HAWAII AND TO DEFINE THE
SAME.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1.—For the purpose of this Act, Hawaiian geese (nene) and all perching birds (scientifically known as Passerine) that frequent the forests of this Territory shall be considered as beneficial, except such as are specified in Section 2.

Section 2. The European or house sparrow, the house finch, the rice bird, the mynah, the native crow or alala and any im-

ported species of perching bird (or Passerine), (injurious to forestry or agriculture) shall not be protected by this Act.

Section 3. It shall be unlawful for any person to catch or kill any perching bird (or Passerine) other than those specified in Section 2, or to have in his or her possession the body of any such bird, or to take, destroy or have in possession the nest or eggs of any such bird.

Section 4. Any person violating this Act shall be guilty of a misdemeanor and on conviction shall be fined Ten Dollars (\$10.00) for each offense, and Fifty Dollars (\$50.00) for each perching bird (or Passerine) killed or caught, other than those specified in Section 2, or for each body or part of the body of such bird that he or she has in possession, or for each nest or egg of such bird as is destroyed or possessed in violation of this Act; or shall be liable to imprisonment for two weeks or to both fine and imprisonment at the discretion of the court; provided, however, that the preceding sections of this Act shall not apply to any person holding a permit, issued in accordance with the provisions of the next Section of this Act, giving him or her the right to collect any species of perching bird (or Passerine), their eggs or nests for scientific purposes only, unless such person shall violate the conditions of such permit.

Section 5. To any person who shall furnish satisfactory evidence that he or she is a duly authorized agent of some scientific institution and is collecting birds, their nests or eggs, for such institution, or for private scientific study and not for sale, the Commissioners of Agriculture and Forestry of this Territory, or such agent as they appoint, may issue a permit to collect for such scientific purposes, a limited number of any species of perching birds (or Passerine), (the number of each and any species that may be caught or killed being stated by the aforesaid Commissioner of Agriculture and Forestry or the agent appointed by them), at any time between and including the first day of October and the last day of February next following, but at no other time whatsoever.

Section 6. Any person to whom such permit to collect perching birds (or Passerine), their eggs or nests shall be issued, shall file with the Commissioners of Agriculture and Forestry, or their agent, a good and sufficient bond to the Territory of Hawaii in the sum of Two Hundred Dollars (\$200.00), with two responsible citizens of this Territory as sureties, conditioned that if the holder of said permit shall be convicted of violation of any of the provisions of this Act, or of those of the permit issued to him or her, the said bond shall be forfeited.

Section 7. The applicant to whom a permit to collect perching birds (or Passerine) is issued, shall pay a fee of One Dollar (\$1.00) to defray the expense of such permit, said permit to bear the name and post office address of the holder, a copy of this

Act, to which the holder shall attach his or her signature, and a list showing the greatest number of each species of perching bird that may be killed or caught by the holder of the permit; said permit is not transferable and holds good only for one season, i. e., from the first of October to the last day of February next following.

Section 8. In all proceedings against any person for violating the provisions of this Act, such person shall be deemed to be without the permit herein provided for unless he shall produce the same.

Section 9. All Acts and parts of Acts inconsistent with this Act are hereby repealed.

Section 10. This Act shall take effect from and after the date of its approval.

Approved this 25th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 69.

AN ACT

TO AMEND CHAPTER 28 OF THE REVISED LAWS OF HAWAII BY
ADDING TO SAID CHAPTER A SECTION TO BE KNOWN AS
SECTION 389A.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Chapter 28 of the Revised Laws of Hawaii is hereby amended by adding a new section thereto to be known as Section 389A and to read as follows:

"Section 389A. It shall be the duty of the Board to make rules and regulations, and to amend the same from time to time, in its discretion, subject to the approval of the Governor, for and concerning the importation into the Territory of bees and for the preservation, protection and improvement of bees now within the Territory; and for the quarantine, inspection, fumigation, disinfection, exclusion or destruction either upon importation into the Territory or at any time or place within the Territory of any bees and any box or other container and their contents in which bees have been imported or contained, which is or may be infested with or liable to assist in the transmission or dissemination of any insect or disease injurious to bees. All rules and regulations made as aforesaid shall have the force and effect of law. It shall be the duty of the Board to establish an observational apiary and all bees imported into the Territory shall be

there quarantined free of cost to the owners until such time shall have elapsed as to enable the proper entomologist or inspector of the Board, to certify to the owners that such bees are clean and free from disease. The entomologists or inspectors of the Board may enter upon the premises of any bee keeper for the purpose of inspecting apiaries, and of carrying out the orders of the Board and they shall not be holden guilty of any misdemeanor by so doing nor shall they be personally liable in damages except for acts beyond the scope of their authority or due to their own negligence.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 17th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

WORK ON HAWAIIAN FRUIT.

Volume I of Mr. Gerrit P. Wilder's work upon the fruits of our islands has recently been issued. It is an extremely interesting publication and will be noticed at length next month.

THE MAY FORESTER.

The Forester for May is well in hand and will be published shortly. It contains, besides other matter, an exceptionally important paper by Dr. Cobb upon the diseases of pineapples. We would advise growers of this fruit to secure any extra copies they may require as early as possible. We anticipate a large demand for the May number and it will probably be difficult to obtain it, in a short time.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii," General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii," General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

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HONOLULU, HAWAII.

~ PINEAPPLE NUMBER ~

VOL. IV

MAY, 1907

No. 5

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THE
Hawaiian Forester
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OF

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David Haughs, *Forest Nurseryman.*
David Kapihe *Forest Ranger for Tantalus.*

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DIVISION OF AGRICULTURE.

In Coöperation with the Hawaii Experiment Station.
Jared G. Smith, *Special Agent in Charge.*

CLERKS AND STENOGRAPHERS.

Miss Melika Peterson.
Miss Ella K. Dayton.

NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. IV.

MAY, 1907

No. 5

The Forester takes great pleasure in presenting this month an able paper by Dr. N. A. Cobb upon the present status of the Hawaiian pineapple industry with regard to threatened fungoid and insect pests. The wide experience of the writer, not only with regard to the special industry which his article touches, but also in general plant pathology and crop technology, entitles his conclusions to great attention and renders them authoritative. It is to be sincerely hoped that the rapidly growing pineapple industry of Hawaii will long continue its prosperous course and will successfully solve as they arise, those problems which must be expected from time to time to threaten its well being. In this, as in all tropical agricultural enterprises, success can only be achieved by constant vigilance and by the prompt application of scientific remedies. To this end we would urgently direct all pineapple growers in the Territory to a careful consideration of Dr. Cobb's paper.

MEETING OF THE BOARD OF AGRICULTURE AND FORESTRY.

At the meeting of the Board of Agriculture and Forestry, held on April 3 last, the following Commissioners were present: Messrs. W. M. Giffard, C. S. Holloway, secretary, A. W. Carter and Gerrit P. Wilder. In the absence of Mr. Thurston, Mr. W. M. Giffard presided.

Messrs. R. S. Hosmer, Superintendent of Forestry; Jared G. Smith, Special Agent in Charge of the Federal Experiment Station; Alexander Craw, Superintendent of Entomology; Jacob Kotinsky, Assistant Entomologist, and Dr. J. C. Fitzgerald, Assistant Veterinarian, were in attendance.

At the close of the introductory business, Mr. Giffard, in expressing regret at the resignation of Mr. Thurston from the presidency of the Board, suggested the desirability of electing a successor. In the discussion which ensued, Messrs. Carter and Wilder advised deferring action in this matter until the two recently-appointed members of the Board, Messrs. Paul R. Isenberg and L. G. Kellogg, who were both absent from Honolulu, could be present. This course was finally adopted. Mr. Carter, in

speaking of the work of the former president of the Board, said substantially as follows: "I wish to record my appreciation of Mr. Thurston's work in connection with the Board of Agriculture both as a member and as its president. It was greatly through his action that its organization was perfected, and the bill which created it was drafted with his coöperation. Through his energy and the quality of his work, the duties of the other members of the Board have been greatly lightened, and it is only fitting that at the close of his tenure of office suitable recognition of this should be had. I therefore move that the secretary be instructed to write to Mr. Thurston a letter of appreciation of his services."

The motion was unanimously carried.

VARIOUS REPORTS.

Mr. Hosmer reported the resignation of Byron O. Clark as fire warden at Wahiawa, on account of his change of residence and recommended A. M. Nowell as his successor. The recommendation was adopted.

The resignation of Thomas S. Kay as fire warden of North Kohala was also reported. Mr. Kay recommended George C. Watt, manager of Kohala Sugar Co., as his successor. Mr. Hosmer endorsed the nomination and the meeting appointed Mr. Watt.

Mr. Hosmer submitted a report from Charles L. Judd, of the Yale forestry school, on his work at Lihue last summer, and also a thesis by the same author. The report was very creditable, Mr. Hosmer said, and he proposed to prepare a bulletin of some of its contents.

Mr. Holloway now read a letter from George C. Munro regarding his investigations of forage plants on the Island of Molokai. Mr. Munro offered to furnish a special article on the subject for the Hawaiian Forester and Agriculturist, or for a departmental bulletin. His recent visit to New Zealand, his native country, was mentioned as having increased his knowledge upon forage plants.

Mr. Smith, in the course of a general discussion on the offer, said he had seen the article and from a cursory perusal thought it a useful paper.

It was voted to refer Mr. Munro to the editor of the Agriculturist.

Dr. Fitzgerald orally reported the slaughter of ten horses, previously branded for glanders, at the Moiliili rice plantation; and also another outbreak of glanders at another place in the same locality. Dr. Nørgaard, the head veterinarian, had gone to Maui at the request of Alexander & Baldwin. Dr. Fitzgerald also told of the work of the division relative to mangy dogs.

Mr. Smith spoke of the increase in the Federal appropriation for State and Territorial agricultural colleges to \$30,000 a year,

under a plan of increasing it until it reaches \$50,000 as the annual subsidy for each of such institutions. He further stated that the station entomologist, Mr. Van Dine, would leave for Washington this week to confer with the department officials on the honey standard. They expected him to bring back some Cyprian and Carniolan queen bees. It was hoped he might attend the National Anti-Mosquito Association meeting in New York.

Mr. Smith referred to Dr. Nørgaard's investigations in search of the sheep pest (the screw worm) and the cattle pest (the horn fly), but Mr. Giffard, as chairman of the entomology committee, will report fully on this matter later. It may be mentioned, however, that a parasite to destroy the horn fly, imported by Prof. Koebele in 1898, seems to be doing its work well.

The Federal station was continuing rubber experiments. Those in tobacco culture were exhausted, but Mr. Smith had some bales of merchantable leaf tobacco on hand besides samples sent to New York.

Mr. Carter stated that about 700 fruit trees had been planted on the Island of Hawaii, and Mr. Higgins had been sent from the Federal station to superintendent the cultivation. The list comprised, among other trees, apples, peaches, pears, apricots and plums.

Mr. Alexander Crow, Superintendent of Entomology, reported on the examination of mail matter and freight for the detection of insect pests.

With the passing of some minor expense bills the routine business was finished and the meeting adjourned.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

ROUTINE REPORTS.

At the meeting of the Board held on April 3, 1907, the following routine reports of the Division of Forestry were read, accepted and ordered placed on file:

November 28, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report covering the routine work of the Division of Forestry from October 31 to date:

During this period I have been in the office in Honolulu, engaged with the preparation of reports and other details in con-

nection with the creation of proposed forest reserves on Oahu, Hawaii and Kauai, with correspondence in regard to the library, with the gathering of material preliminary to the preparation of the annual report of the Division of Forestry for 1906, and with the regular routine work of the division.

On November 2, Arbor Day, I spoke to the pupils of the Honolulu High School on "Forestry in the United States," and on November 21 I appeared before the Hawaiian Sugar Planters' Association to read a report supplementing that of the association's Committee on Forestry regarding the work of this Division, and the progress of forestry in the Territory during the past year.

On November 12 the final papers were signed in the agreement whereby Messrs. Alexander & Baldwin turn over to the management of the Board of Agriculture and Forestry the area of privately owned land within the Koolau forest reserve on Maui. This, with the government land in the reserve, under lease to Alexander & Baldwin, approximates 27,000 acres. The consummation of this transfer I believe to be one of the most important steps that has yet been taken in the forest movement in Hawaii, in that it marks the real beginning of a closer coöperation of forest owners with the Government in the systematic management of their forest properties.

During the past month the annual report of the Board for 1905 has been widely distributed throughout the Territory. Reports have also been sent to a carefully selected list of foreign exchanges.

On November 14 there was issued Press Bulletin No. 4 of the Division of Forestry, entitled "Instructions for Propagating and Planting Forest Trees," by David Haughs; 4 pp., 1000 copies.

Arbor Day, November 2, was generally observed in the schools throughout the Territory. Mr. Haughs' report shows that a total of 2580 plants were furnished free for this purpose from the Government Nursery, as against 3554 for 1905. As was the case last year, the freight charges were paid by the Department of Public Instruction.

A number of important accessions in the way of botanical and entomological books have recently been received by the board library. A list of the new books will be given in an early report.

The library room of the Board has been used during the month by other organizations as follows: Hawaiian Entomological Society, November 1; Poultry Association, November 13 and 21; Palolo Improvement Club, November 23.

Very respectfully,

RALPH S. HOSMER,

Superintendent of Forestry.

December 6, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report covering the routine work of the Division of Forestry from November 28 to date:

During this period I have been in the office in Honolulu engaged in the preparation of material for the next annual report of the division and with routine work: excepting that on Tuesday last I visited the land of Honouliuli, on this island, in company with Messrs. H. M. von Holt and O. L. Sorenson of the Survey Department, to determine the location of a portion of the boundary of the proposed forest reserve on that land. This project I shall report on to the board in the near future.

On Wednesday last Mr. Haughs visited the land of Waipio, District of Ewa, on this island, to draw up a planting plan to be followed by the Ii Estate in planting a portion of that land.

The library room of the Board has been used once during the week, for a meeting of the Honolulu Improvement Advisory Board, which was held on Friday, November 30.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 3, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report covering the routine work of the Division of Forestry from December 6, 1906, to date:

ANNUAL REPORT.

During the greater part of this period the staff of the Division of Forestry has been occupied with routine work of various kinds. During the month of December, both Mr. Haughs and I were busy with the compilation and preparation of the annual report of the Division of Forestry. Although the first installment of copy was turned over to the printer early in January, during the whole of that month much time was spent on the report, both in

reading proof and in attending to details in connection with its publication. And in February also, when the complete report was actually in press, not a little of my own time was spent in seeing the minor details contributing to its correctness were attended to.

The report was finally issued on February 28, when about 200 copies were received from the printer and distributed to the members of the Legislature, Territorial officials and persons in one way or another connected with the Board. The full edition of the main report consisted of 2500 copies. There have also been printed separates, containing the reports of the several divisions, five hundred each. The main report has been widely distributed throughout the Territory and to addresses on the foreign mailing list of the Board.

ROUTINE WORK.

Some of the most important routine matters connected with the Board have been the preparation of estimates for the coming fiscal period and other financial statements having to do with the re-segregation of the appropriation for the present period. During the last four months, while I have been in Honolulu, I have been able to take care of much routine detail in connection with the library and other matters concerning the Board and the Division of Forestry. Much of this work leaves little to show for the time put into it, but were it not done the effect would be very apparent.

REPORT OF THE FOREST NURSERYMAN.

Mr. Haughs' report tells of his activities since the first of December. I may repeat that during this time he has prepared five planting plans for as many individuals or corporations. This work has necessitated one trip to the Island of Hawaii, one to the Island of Maui, and two to points out of Honolulu on this island. The collection of seed from forest trees in the vicinity of Honolulu has gone on as opportunity offered and a number of shipments of foreign seed have been received from different correspondents of the division. A considerable number of packages of Hawaiian seed have been sent out in exchange to botanic gardens and to persons on our Exchange List. This list is constantly being enlarged.

CONGRESSIONAL SEED.

During the past two months the 1906 quota of Congressional vegetable and flower seed forwarded to this office by the Delegate to Congress, Hon. J. K. Kalaniana'ole, has been distributed to

the schools maintaining school gardens and to persons applying under an offer published in the various newspapers.

LIBRARY.

The Library of the Board has received a number of important accessions through purchase since my last report, in the way of forestry, botanical and entomological books. The serial publications regularly received have also been increased since the first of the year by the addition of a number of magazines not heretofore taken. As has been said many times before, both the books and the periodicals are open to the public for reference, daily, during office hours.

I am glad to report that since the first of the year the number of persons per month who consult the library has been larger than in the past.

During January the Board building was painted, as was also the exhibit room containing the woods and fruits. Pursuant to action taken by the Board at an executive meeting held on January 8, the cottage in the Nursery grounds is now being put in shape for occupancy by the Forest Nurseryman.

LEGISLATION.

Since the beginning of the session of the present Legislature several acts have been passed that more or less directly affect this Board. Among these may be mentioned Act 4, to amend Chapter 28 of the Revised Laws so that forest land belonging to the Government may be set apart as forest reserves whether under lease or not. This is a law for which the Board has been working for some time. The Emergency Appropriation Bill contained an item of \$1500 for the use of this Board during the remainder of the present fiscal period. The other bills which less directly interest the Board are those providing for the remission of taxes on certain of the diversified industries and that creating an agricultural college.

FOREST FIRE SERVICE.

On February 9 a special warning notice for a period of twelve months was issued for the Tantalus section, and on March 19 a similar notice for a six months' period was issued for the upper part of the Waialua District, back of Wahiawa. I am glad to say that no forest fires have been reported this winter.

MEETINGS.

The use of the library room for evening meetings continues to

give satisfactory results. Since December the following organizations have made use of it:

Hawaiian Entomological Society, December 6, 1906; February 7, 1907.

Hawaiian Poultry Association, December 11, 1906; January 8, February 12 and March 12, 1907.

Honolulu Improvement Advisory Board, December 28, 1906; February 18 and March 15, 1907.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

April 3, 1907.

R. S. Hosmer, Esq.,
Superintendent of Forestry,
Honolulu.

Dear Sir: The following report gives the principal work done by the men employed by the Division of Forestry from December 4, 1906, to April 3, 1907:

CO-OPERATIVE PLANTING WORK.

During the period mentioned the writer has made one trip to Maui, one to Hawaii and two to places on Oahu outside of the District of Honolulu. Six places have been visited in the District of Honolulu at the request of parties asking for advice on different subjects connected with the growing and care of plants.

Reports and recommendations on the following places visited have been made and the applicants given a copy of each. The originals have been placed on file in this office.

December 12 and 13: Report with recommendations on the grounds and certain lands belonging to the Lahainaluna School, Maui.

February 8: Examination and report, with recommendations, on two tracts of land in the District of Puna, Hawaii, belonging to the Puna Sugar Company and known as "Kamaili tract" and "Keahealaka tract."

March 1: Report, with recommendations, on the reforesting of certain lands belonging to the Boys' Industrial School, Waialeale, Oahu.

March 2: Report, with recommendations, on the reforesting

of part of what is known as the "Kawailoa tract," belonging to the Waialua plantation.

On March 26, at the request of Father Adelbert Rielander, a visit was made to the Catholic Mission lands in Kalihi Valley. A report on the lands is at present being prepared.

An application for advice and assistance on tree planting, etc., has been received from A. M. Nowell, manager of the Wahiawa Water Company. A visit to Wahiawa will be made in the near future.

THE COLLECTION AND DISTRIBUTION OF SEEDS.

The collection of seed has been continued. Over fifty full sets are being prepared for exchange purposes. These will be sent to botanic gardens, experiment stations and other institutions on our exchange list.

The consignment of vegetable and flower seeds received from the Hon. J. K. Kalanianaʻole are being gradually disposed of. Many applications are coming in from all over the Islands for same.

NURSERY AND SEED CATALOGUES.

A large assortment of nursery and seed catalogues is now on file in this office for the use of the general public. A communication was sent to the Gardener's Chronicle, London, stating that we would like to receive catalogues of the different nursery and seed firms in Great Britain. The communication was published in the above paper. Since then catalogues have been coming in from all over Europe. We have also on file catalogues of the leading firms in the United States, Australia, Japan and Ceylon.

THE NURSERY.

The work in the Nursery has been principally routine work. Preparations are being made to curb the principal walks. The narrow cross walks are being filled up and will be grassed over. Coral rock is being carted and the walks will be made similar to the one at the east side of the office.

NUUANU STATION.

Since the first of March only one man has been employed at the station. Keeping the trees clear of vines is the principal work.

Very truly yours,

DAVID HAUGHS,

Forest Nurseryman.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

PRINCIPAL CITRUS INSECTS IN HAWAII.

BY JACOB KOTINSKY.

(Continued from last "Forester.")

NOXIOUS INSECTS.

Primarily the citrus insects may be grouped as either injurious or beneficial. To those not familiar with correlating the habits of insects with their appearance there are no ready external signs by means of which to differentiate the useful insects from the injurious ones. It becomes necessary therefore to familiarize ourselves with the appearance and habits of each species separately in order to learn to distinguish friend from foe. As the injurious insects require our first attention we will give them first consideration.

PURPLE SCALE (*Lepidosaphes pinnæformis*, Bouché).

No insect affecting citrus plants on these islands is more destructive to these plants. Checked but little by predaceous or parasitic enemies, the scale, once it secures lodgment upon a tree, multiplies rapidly and continues sapping its vitality until the tree is killed, unless some artificial remedy is applied.

Larva. The group of scale insects to which the purple scale belongs are rather peculiar in that through most of their lives their resemblance to an ordinary insect is very slight or not at all. When newly hatched the larvae bear six legs, a pair of antennae in front, and two rather long waxy filaments projecting behind, a pair of simple eyes and a short sucking beak. At this stage no known difference between the sexes exists, and it is the only period in the life of the female when she is not fixed to the host. In this condition the insect remains but two or three days in our climate, after which it attaches itself to the host, casts its skin and begins to build the scale over itself—its permanent home.

The female scale.—This consists mainly of waxy substance which as it grows older becomes hardened,—leathery or horny. In shape the scale is linear or mussel-shell-like, narrow in front where it consists of the two skins cast by the insect in course of growth and wider posteriorly. The first molt lies in front and overlaps the second, which is larger and already covered with considerable waxy matter. The scale proper then extends to the rear so that the entire scale is about 2.5 mm. (0.1 in.) long.

It seldom runs in a straight line, however, since in course of construction, if an obstacle is met, the line is deviated and the scale curves in one or more directions. Most often the scales occur in large numbers, and then they are piled in one on top of the other, sometimes three and more tiers deep, and then of course the curvature of the normally linear scale is almost universal. The surface of the scale is more or less marked by transverse lines, somewhat shiny, and in color brown of various shades, rarely purplish. The name "purple scale" comes from Florida, where it seems to be more purple than here, and because of the color of the male scales.

The male scale is about half as long as, narrower and more linear than that of the female. It has but one cast skin in front, and is rather purplish in color. In structure it is similar to that of the female scale.

Female.—With the first molt the insect is divested of its legs and antennae, leaving but a hair-like proboscis for absorbing food, and the body for carrying on the life processes. Virtually this body is but a sack which later in life becomes filled with eggs, and these laid, the insect dies and dries up where it first settled for life. This sex never develops wings.

Shortly after the second molt the female is impregnated and soon thereafter egg laying commences. The eggs are laid beneath the scale in rows which, as they are gradually pushed backward, lose their regularity. H. G. Hubbard, who studied orange insects in Florida, tells us that one female lays on an average about 45 eggs.

Male.—After casting the first and only skin the insect passes a pupa stage and then emerges as a perfect insect with two wings, six legs and four eyes, two of which replace the mouth for which it has no use. This stage of perfection is attained usually about the time a female, born about the same time, has cast the second skin.

The number of broods produced in course of a year has not been definitely ascertained in these islands, but it can be safely assumed to be somewhere between three and four. It will be readily observed that one pair, unhindered by natural checks, will produce within one year of four broods, 594,436 individuals. It is not surprising that, unassisted, trees are frequently reduced to helplessness and death in course of three or four years.

It is also evident that to start a colony a female must be transported during the short period of her active life, her life as a larva. The male, even tho winged, is a feeble flyer, hence is also largely dependent upon the transportation agencies utilized by the female. This is accomplished by the larva itself in case of contiguous trees. To greater distances the larvae are carried either by wind, birds, or other insects. As a bird or insect rests upon an infested tree while the larvae are crawling about in

search of a place for attachment, these crawl upon the bird's legs and the insect body, and by them carried great distances. Sometime, and when they stop to rest again, the larvae or some of them crawl off and if the food plant is favorable increase there and thus a new colony is started. Man, however, is the most significant transporting agent, especially when great distances are considered. Wherever he went he carried his domesticated plants with him and upon them he also unwittingly carried the agents of destruction of those plants. So regular and certain was he to carry the purple scale upon citrus trees from country to country that now the origin of the insect is unknown because its distribution is universal wherever citrus plants are grown.

Enemies.—There are several enemies of the purple scale in the Territory, but their combined effort seems at times to avail us little in checking the pest. As descriptions of these will follow later we will here only name them. Two ladybirds, the orange and steel-blue, are always to be found, tho but sparingly, on trees infested with this scale. They doubtless devour a good many scales, but they also feed upon other scale insects on these trees, and being few in number, their work is not telling. The same may be said of the internal parasites that manifest their work upon male and immature female scales by the round holes of their exit through the scale after devouring the insect beneath it. These parasites also attack other scale insects, hence, not being specific enemies of the purple scale their work is seldom effective. This spring most of the trees examined, especially the limbs and trunks look remarkably free of scale. Possibly the rains of the past season have depleted their numbers and possibly also the parasite have, temporarily at least, gained the upper hand.

Remedies.—A simple, inexpensive and effective remedy against this pest is the application of a soap (common or whale oil) solution (soap, 1 lb. in water, 4 galls.) applied with an efficient spray pump, while the solution is hot, three or four times in succession at intervals of two weeks. While it is doubtful whether this wash affects the full grown scale owing to its water-proof armor (this group is known as "armored scales") it is sure to kill every young larva it covers, and repeated, should kill all young that may hatch subsequently. That the application must be thoro goes without saying. Every larva possible must be killed or the work is correspondingly nullified in proportion to the number of larvae left alive.

(To be continued.)

REPORTS OF HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, Hawaii, April 3, 1907.

To the Honorable Board of
Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: During the months of January, February and March we inspected thirty-five steam and sailing vessels from the mainland, seventeen from the Orient, ten from Australia and eight from other points, in all seventy-one vessels that arrived from outside the Territory, on which we found twenty-four thousand nine hundred sixty-five (24,965) packages of fruits and vegetables, twenty (20) bales, boxes and cases of plants and trees, and one hundred and fifty-nine (159) packages of seeds and plants by mail. Of the above, twenty-two (22) cases of fruit and fifty-seven (57) packages of plants and trees were infested with injurious insects and were therefore destroyed. Evidently greater care is now being exercised in the selection of fruit and plants sent to this Territory. All imports found slightly infested with insects already established here were fumigated with hydrocyanic acid gas or carbon bisulphide before delivery.

In accordance with your instructions, we have endeavored to locate all the young Indian mangoes which have been propagated from the trees that were imported and planted a few years ago, before the present inspection law was in force. The most of these trees have been located and treated and a record of them taken, so that they may be reinspected again later on.

Because of the widespread existence of "*Asparagus rust*" on the mainland, we now make a practice of dipping in "Bordeaux mixture" all such roots received.

A shipment of seven hundred and twenty cases of onions arrived from Australia on the S. S. Sonoma on February 20 that had been damaged by salt water. In some of the decayed bulbs we observed numbers of very small white maggots and pupae and in breeding out a few they proved to be, as I suspected, "*Pomace flies*" (*Drosophila*), usually found around decaying fruit, or other vegetable matter, and which are classed as scavengers.

From dead specimens of the "*melon fly*" (*Dacus cucurbitae*) received by this Division from the government entomologists of India, we learn of the existence of several parasites that prevent its seldom or ever becoming a pest there. An effort should be made to introduce these parasites here by way of Hongkong. This would be a difficult experiment owing to the great distance, but the undoubted benefit to the melon industry of this Territory, in case these parasites were successfully introduced and established,

would justify the expenditure of considerable money in the attempt to control this pest.

On January 22 the S. S. Mariposa was compelled to call here to secure a supply of fuel oil to finish her voyage to San Francisco from Tahiti. She had on board a quantity of young cocoanuts, also some "alligator pears," which we would not allow to be landed here, the former being subject to the attack of a fly (similar to the melon fly) in some of the South Sea Islands.

On January 11 the four-masted American iron ship E. M. Phelps arrived from Manila. We inspected the ballast on board and found it to consist of dark sand and small shells taken from the beach of Cavite below Manila. We also examined it when it was being discharged, but failed to find any trace of vegetable matter. It was used for cement work in town. Another American iron ship, the Astral, arrived from Japan on March 4 with clean sand and gravel and was allowed to discharge on the wharf. The inspection of ballast of this nature coming from foreign ports is to prevent the introduction of soil which might contain the larvae or grubs of obnoxious insects.

Fifty grafted peach trees slightly infested with the destructive "West Indian Peach Scale" (*Alaucaaspis pentagona*) arrived from Japan and were immediately burned. This is the scale that was introduced into the grounds of the Department of Agriculture at Washington, D. C., and which withstood treble strength of the best liquid insecticides which only killed a very low percentage of them. From the same country came ten small Japanese maple trees badly infested with *Parlatoria theae*, also five Japanese Camellias with *Pseudaulnoidia duplex*. As both these pests were injurious, the plants were also destroyed.

A few orchids from the Philippine Islands were imported having a small larva working in the crowns of the plants. The plants were fumigated with hydrocyanic acid gas even to injuring the foliage, but as the larva did not seem to be affected by the fumigation each plant had to be hand picked before delivery.

Several lots of lemons imported from California were found slightly infested with "red scale" (*Chrysomphalus aurantii*), which is already here. This fruit was therefore only fumigated.

The establishment of the American-Hawaiian line of steamers between Salina Cruz and Honolulu exposes us to a new danger, i. e., the introduction of the serious orange maggot (*Trypeta ludens*). I therefore addressed a letter to the local general freight agent, C. P. Morse, calling his attention to this pest and requesting him to instruct the agents at Salina Cruz not to accept any citrus fruits as freight for any portion of this Territory, nor to allow any one to bring such fruits on any of their steamers. I also enclosed a copy of the Board's regulations and the law covering this matter.

The entomologists of this Board have recently been investigating the result of the introduction and distribution of the parasite (*Eucoila impatiens*) of the "Horn fly," which Prof. Koebele sent this Division from Arizona, and I am pleased to report that it appears to be establishing itself. This parasite has also been noticed by other entomologists, so we feel confident that it will eventually be found wherever colonies were sent during the past season, and that it will be effective in reducing the number of that annoying stock pest. This parasite will be found illustrated on page 147 of your report. This Division has commenced a systematic inspection of the neighborhoods where all of Prof. Koebele's "Horn fly" parasites were distributed, and will shortly report further as to the result of the investigation.

I beg to call your special attention to the recommendation made in my report of 1905 regarding the "Introduction of Beneficial Insects." I respectfully ask that the subject be brought before the present Legislature for action. I quote the following from the Report above referred to:

"Through the efforts of your Honorable Board, several species of internal parasites and predaceous insects for the suppression of our destructive species have been introduced, and from examination we feel hopeful that they will come up to our expectations. As Mr. Kotinsky, my assistant, has referred to this work in detail, it will not be necessary to take this matter up further than to suggest that you bring this important work before the attention of our Territorial legislators urging them to make a liberal appropriation . . . so as to enable you to further continue the search for such friendly assistants to our agriculturists. There is positively no danger from the intelligent introduction of such insects that prey upon injurious species, for their stomachs will no more digest vegetable matter than that of a lion's or tiger's will. Such insects when once introduced are constantly working without pay in the interests of our farmers, planters and, in fact, all lovers and cultivators of trees and plants, not even exacting a portion of our crop as their part. What all this means can be gleaned from the introductory remarks or statement of this report of the enormous loss by the depredations of insect pests. It is the introduced injurious species that prove to be such formidable ones, as they are usually brought into new countries without their more highly-bred, natural checks, which can generally fly away during the time occupied in the transportation of the plants. This way of fighting our insect enemies is not any longer an experimental one, but has saved millions of dollars of property, besides retaining the value of adjoining property already improved or unimproved. Not only is our farming population increased, but our merchants, tradesmen and bank-

ers also feel the effects of the improved agricultural conditions; so all our people are benefited by the expenditure of money in this work.

"We have in Prof. Koebele one of the best and most competent and successful collectors of beneficial insects in the world, so that any money appropriated for such work will be expended in the best manner, in the interest of these Islands, as his past work has fully demonstrated. As a business proposition I feel confident that our legislators will not hesitate in furnishing you with ample funds to carry out this work so successfully started."

What has been accomplished by the sugar planters in controlling the cane leaf-hopper would justify your presenting a special bill for an appropriation of at least \$5000 to carry on the work of introducing beneficial insects during the next biennial period.

Respectfully yours,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

THE NEW LAWS.—Continued.

ACT 106.

AN ACT

TO AMEND SECTIONS 370, 371, 373 AND 375, AND TO REPEAL SECTION 372 OF THE REVISED LAWS OF HAWAII SO AS TO REORGANIZE THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 370 of the Revised Laws of Hawaii is hereby amended by striking out the period after the word "Senate" in line four thereof, and by inserting after said word "Senate" the following words, "one being designated as President of the Board," so that the Section as amended shall read as follows:

"Section 370. Commissioners, Appointment, Tenure. There shall be a Board of Commissioners of Agriculture and Forestry of five members, who shall be appointed by the Governor by and with the advice and consent of the Senate, one being designated as President of the Board. One of said Commissioners

shall be appointed to hold office for one year, one for two years, one for three years, one for four years, and one for five years from January 1, 1904. Upon the expiration of the respective terms of the said Commissioners, their respective successors shall be respectively appointed for a term of five years. Upon a vacancy occurring in said Board, a Commissioner shall be appointed to fill such vacancy for the remainder of the unexpired term."

Section 2. Section 371 of the Revised Laws of Hawaii is hereby amended by striking out the words "President and another" in line two thereof; and also by striking out the word "officers" in line three thereof, and inserting in lieu of said word "officers," the word "Secretary," so that the Section as amended shall read as follows:

"Section 371. Board, Officers, Quorum. The Commissioners shall elect one of their members Secretary of the Board. The Board shall have power to change its Secretary from time to time. A majority of the members of said Board shall constitute a quorum thereof, with power to transact any business within the powers or jurisdiction of the Board."

Section 3. Section 372 of the Revised Laws of Hawaii is hereby repealed.

Section 4. Section 373 of the Revised Laws of Hawaii is hereby amended by striking out the first four lines thereof, together with the word "the Superintendent of Public Works" in line five thereof, and by inserting in lieu thereof the following words "the powers and duties vested prior to April 25, 1903, in the Commissioner of Agriculture and Forestry and thereafter transferred to and vested in the Superintendent of Public Works are hereby transferred to and vested in the President of the Board," so that the Section as amended shall read as follows:

"Section 373. Executive Officer of Board. The powers and duties vested prior to April 25, 1903, in the Commissioner of Agriculture and Forestry and thereafter transferred to and vested in the Superintendent of Public Works, are hereby transferred to and vested in the President of the Board, who shall be the Executive Officer of the Board, subject to the superintendence and control of the Board."

Section 5. Section 375 of the Revised Laws of Hawaii is hereby amended by striking out the period after the word "pay" in line two thereof, and inserting after said word "pay" the words "except the President, who shall receive such salary as may be appropriated by the Legislature;" also by striking out from said section the sentence "The Superintendent of Public works shall receive no pay for services performed by him under the terms of this Chapter other than the salary appropriated by the Legislature for his said office of Superintendent of Public Works," so that the Section as amended shall read as follows:

"Section 375. Board, Expenses, Pay. The members of the Board, appointed under this Chapter, shall serve without pay, except the President, who shall receive such salary as may be appropriated by the Legislature. The Board shall be entitled to pay the traveling expenses, within the Territory, of its members when actually engaged in business relating to the work of the commission, and also all cost of postage, stationery, correspondence, records, printing and other expenses necessarily or properly incidental to the business of the Board."

Section 6. This Act shall take effect from the date of its approval.

Approved this 29th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 94.

AN ACT

MAKING SPECIAL APPROPRIATIONS FOR THE USE OF THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF THE TERRITORY OF HAWAII, DURING THE TWO YEARS WHICH WILL END WITH THE 30TH DAY OF JUNE, A. D. 1909.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. The sum of Ten Thousand (\$10,000) Dollars is hereby appropriated out of any money remaining in the Treasury for and on account of the Loan Fund, for the erection of a building or buildings for the use of the College of Agriculture and Mechanic Arts and the purchase of fixtures, apparatus, and appliances for the same.

Section 2. The sum of Fifteen Thousand (\$15,000) Dollars is hereby appropriated to be paid out of all moneys in the Treasury of the Territory received from all current receipts of the general revenue for the use of said College for the biennial period ending June 30th, 1909, as follows:

Salaries and pay roll	\$10,000
Incidental expenses	5,000

Section 3. This Act shall take effect from and after the date of its approval.

Approved this 23rd day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

BY AUTHORITY.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Notice is hereby given that MR. W. M. GIFFARD has been elected PRESIDENT of the BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY to succeed MR. L. A. THURSTON, resigned. ,

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, H. T., April 9, 1907.

Notice is hereby given that MR. A. M. NOWELL is now DISTRICT FIRE WARDEN for the whole of the District of Waialua, Island of Oahu.

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, T. H., April 6, 1907.

Notice is hereby given that MR. GEORGE C. WATT has been appointed DISTRICT FORESTER in and for the District of North Kohala, and that portion of the District of Hamakua lying between the District of North Kohala and the Waimanu Valley, Island of Hawaii; and DISTRICT FIRE WARDEN in and for that portion of said District of North Kohala extending along the coast from the land of Kaauhuhu to the Hamakua District line.

Notice is hereby given that MR. SAMUEL P. WOODS has been appointed DISTRICT FIRE WARDEN for that portion of the south part of the District of North Kohala, Island of Hawaii, extending around the coast from the north boundary to the land of Kawaihae I, to and including the land of Kaauhuhu.

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, T. H., April 8, 1907.

RULE AND REGULATION BY THE BOARD OF COMMISSIONERS OF
AGRICULTURE AND FORESTRY CONCERNING THE
IMPORTATIONS OF RICE.

RULE III.

The Board of Commissioners of Agriculture and Forestry hereby make the following rule and regulation:

Section I. For the purpose of preventing the introduction into the Territory of Hawaii of insects, their larvae or pupae, injurious or liable to become injurious to rice either growing or stored, all persons, companies and corporations are hereby prohibited from introducing or importing into the Territory of Hawaii or into any of its ports, any rice infested with such insects.

Section II. If any rice infested with insects, their larvae or pupae, injurious to rice either growing or stored, shall be imported or introduced into the Territory of Hawaii or into any of its ports, the same shall, in the discretion of the Board of Commissioners of Agriculture and Forestry, or its duly authorized agent, officer or inspector, be immediately destroyed or deported at the expense of the importer or introducer, and the person or persons or corporation introducing or importing the same shall be guilty of a misdemeanor and shall be liable to the penalty or penalties provided by law.

Section III. This regulation shall take effect from and after the approval thereof by the Governor.

C. S. HOLLOWAY,

Secretary and Executive Officer.

Approved:

G. R. CARTER,

Governor of Hawaii.

Honolulu, September 7th, 1906.

The publication of this regulation in the "Forester" was inadvertently overlooked.

NEW WORK ON HAWAIIAN FRUIT.

Fruits of the Hawaiian Islands, by Gerrit Parmile Wilder, in three volumes, Volume I, Illustrated with thirty-six Half-Tone Plates, Honolulu, 1907, Hawaiian Gazette Co., Ltd.

The first volume of Mr. Gerrit P. Wilder's work on the fruits of our islands, has recently been published, and in its merits quite fulfils the expectation with which it was anticipated. It consists of a series of half-tone reproductions of Hawaiian fruit, each of which is accompanied by an interesting description. Botanical, historical and cultural notes are freely given and add greatly to the value of the volume to the general reader, who often is deterred from the enjoyment of books of a similar nature from a multiplicity of technical terms. Here, however, scientific nomenclature is not obtrusive and one unversed in botanical lore, can find both recreation and enjoyment.

Mr. Gerrit P. Wilder has long held a reputation for the work upon which he is engaged of introducing and developing new and better varieties of fruit. In the past he has achieved great success in the grafting and budding of avocado pear and mango trees. He is also actively engaged in evolving types of such fruits as papaias and mangoes better suited to the peculiar requirements necessitated by supplying a market two thousand miles distant from the source of supply. This is a work requiring some years for a satisfactory result, but upon which encouraging headway has been made.

To many who have not investigated the subject, the wide diversity of the fruit grown in the islands as shown in the first volume of Mr. Wilder's book, is as astonishing as it is pleasing. The species illustrated and described include such well known ones as the avocado pear, the papaiia, and the fig, and such rare specimens as the durian, the sapodilla and the sapota. Those who have been wont to associate the delicious Poha with everything Hawaiian, will be surprised to learn its Brazilian origin, and its association with the prosaic "Cape Gooseberry." So long a sojourn in our midst has given the Poha a familiar air and allowed it to masquerade as a member of our native flora.

The information regarding the fruit of the male and female papaiia trees will be interesting to many, and also that concerning the durian, which possesses the unique distinction of conjoining the most repulsive and nauseating odor with the most fascinating and luscious flavor. This tree, a native of Java, is considered by some authorities to produce by far the most delicious fruit in the world. Its flavor is said to resemble a mixture of sherry, cream, ripe pineapple and onion, and is so highly regarded that travelers make journeys even from Europe to enjoy it.

The student will find much in Mr. Wilder's book to repay its perusal. We commend it to all who are interested in the study of our island fruits and we look forward to the publication of future volumes.



Mountain Apple.

One-third natural size.

—From Gerrit Parmile Wilder's book, "*Fruits of the Hawaiian Islands.*" Plate viii.

NOTES ON SOME DISEASES OF THE PINEAPPLE.

BY N. A. COBB.

From an examination of three pineapple areas in widely different parts of the world I should say that the probable course of events to be expected in the growth of such an agricultural industry would be as follows:

First, the introduction of fairly good seed pines on fairly good land suitable to the industry.

Second, a period of rapid growth during which the profits are satisfactory.

Third, a period of falling off in the yields, due to the accumulation of the pests of the crop.

Fourth, a period of loss, followed by the closing of many of the concerns engaged in the industry, a period of keen disappointment to many having money invested in the industry.

Fifth, a period of adjustment, during which the profits are small to nearly all concerned, until such methods of growth are reached as can be permanently followed with paying results.

I do not believe that the main features of this program can be altered. I base this belief on the fact that there is no known way of preventing the accumulation of the pests of the crop. To a large extent it is possible to repair the depletion of the soil due to the growth of the crops, and at a cost that still leaves a good margin of profit. It is known that to a certain extent the fall in yield, where pineapples follow pineapples for a series of years, is due to what is commonly termed exhaustion of the soil. It is my belief that this loss is much less serious than that due to the accumulation of disease. The diseases arrive in ways that are beyond our knowledge in some cases, and beyond our observation in nearly all cases, and hence are to a great extent beyond our control. We can delay their arrival, and we can hinder their development after they do arrive, at least in the case of those whose nature we understand, but that is all we can expect to do.

This may seem a rather gloomy picture, but I have put in the darks first for several reasons. I have seen something of

the disappointment that follows from not appreciating the facts as above presented. A broken industry and a disappointed people are not pleasant sights, and one does not soon forget the impression they create. Their greatest use is to teach others to profit by studying into the cause of the misfortune.

It seems to me that the principal cause of failure in the pineapple industry is contained in the third stage sketched above, namely, in the period of falling off in the yields due to the accumulation of the pests of the crop.

Now, while it is not possible by any known practicable means to prevent the arrival of these pests, or to prevent their accumulation, it is possible to delay their arrival, and to hinder their development to such an extent that the period of acute depression in the business, which has been a very constant feature of the history of such enterprises, can be both delayed and mitigated so that the industry does not have to suffer a readjustment following on bankruptcy and all its attendant disappointments and evils. All that is necessary to do this is to provide beforehand for these necessary evils.

The main line of action is to watch for the arrival of possible pests with a view to stopping them altogether. Nothing less should be the aim of all inspection and quarantine of imports. This part of the plan is in operation in Hawaii in the form of an inspection of imports. The effect of this beneficent law should be to at least delay the arrival of pests. It is unreasonable to expect the impossible. In spite of all precautions, we know that diseases do occasionally get past almost any inspection. After they arrive at the pineapple plantations they may be hindered in their accumulation, and the exercise of sufficient care will prevent their ever becoming the scourge they may become if they are neglected.

The following pages deal with one of the main rots of the pineapple that has already arrived at the plantations on the islands of Oahu and Kauai, and in all probability the remaining islands where the pineapple is grown. At the present time this rot is not causing such severe losses as it will undoubtedly cause in the near future, unless greater precautions are taken to prevent its accumulation. I refer to the fungus scientifically known as *Thielaviopsis ethacetica*, Went. At present this is the commonest rot of the pineapple in Hawaii. Nearly every pineapple grower will at once recognise it when I say that it is the soft rot accompanied by a sooty black color of the watery tissues in the last stages. The earlier stages are not accompanied by the black color; on the contrary, the fungus merely softens the tissues, discoloring them but little.

I have described this disease as it relates to cane in a bulletin published by the Hawaiian Sugar Planters' Association. The following is quoted from that source. After reading it the reader will see that this rot is one of equal interest to both industries.

THE PINEAPPLE DISEASE.

(*Thielaviopsis ethacetica*, Went.)

"The disease was first studied by Dr. F. Went, in Java. He first investigated and classified the fungus causing the disease. Since that time (1893) it has been observed in the West Indies and in Hawaii.

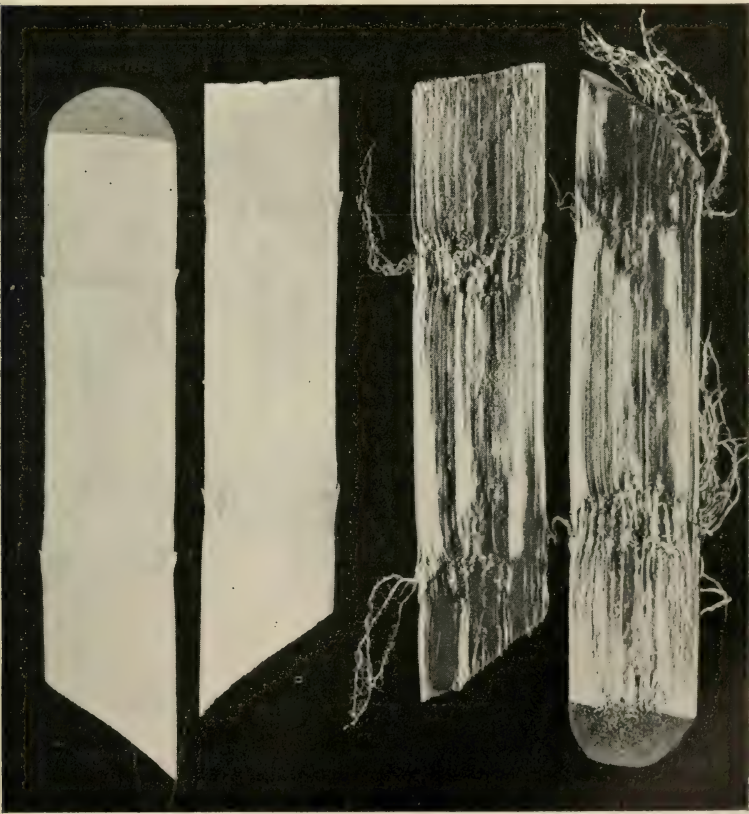


Fig. 1. Two cuttings to show more clearly the destructive action of the pineapple fungus. The right hand untreated cutting has been completely ruined in a few days although its condition when planted was like that of the sample shown at the left.

It is commonly asserted that this disease of the sugar-cane receives its common name on account of the fact that its presence in the tissues of the cane gives rise to an odor resembling that of pineapple. The specific name of the fungus, *ethaceticus*, refers to the same fact, its translation into English reading, "acetic ether," so that we may call the species the acetic-ether-producing fungus.

It is true, that, in some of its stages, and especially in some varieties of cane, the growth of the fungus gives rise to an odor reminiscent of ripe pineapple, but a delicate nostril would seldom, I think, mistake one odor for the other. More often the odor is that which we associate with fermenting fruit juice, due no doubt to a mixture of the vapors of various alcohols, acids, and ethers, prominent among which may be, and probably is, acetic ether. This odor of fermentation is the usual characteristic of most of the stages of the pineapple fungus as it occurs in cane. Only the later stages of the fungus attack are devoid of this odor, or if present, it is overpowered by others.

There is another reason why the name pineapple disease may be applied to this malady of cane, and that is that the same disease attacks the pineapple, as well as some other fruits. This fungus is, in fact, one of the serious diseases of the pineapple in some places. It is prevalent in the Hawaiian Islands on pineapples and does no small damage on some plantations.

The fact that the disease can be present in a most pronounced form without the odor of pineapple being noticeable renders the name a little unfortunate from the first point of view, but nothing can be said against the name from the second point of view, that is to say in view of the fact that the disease also attacks the pineapple. It is well to know that in fields where the disease is common one may often dig up and examine scores of cuttings without once detecting a pronounced odor of pineapple. As before stated, the variety of cane is one factor in the production of this odor. Yellow Caledonia is one of the varieties that even when suffering acutely usually gives off merely an odor of fermentation. I have found the ethereal odor most pronounced in such varieties as the Striped Singapore, and in such canes the odor is sometimes much stronger than that of the most highly scented pineapple.

HOW TO DETECT PINEAPPLE DISEASE.

To detect this disease in planted cuttings one has therefore to rely upon other indications than the odor of the diseased tissues. The odor is usually present in a faint degree, and is certainly quite different from that of sour cane. As a rule it is a very faintly ethereal odor that almost evades detection and is rather earthy and clean in character.

The visual characters of the disease are subject to considerable variation, but there is one character that is more or less decisive, and that is the occurrence of a "pipe" through the axis of the cane. This pipe is dark colored, in fact, is sooty black when fully developed. I know of no other cause for this peculiar appearance when it occurs in planted cane cuttings. The rind-disease will discolor the interior of cuttings, and even render their tissues more or less black. But these dark appearances are marginal rather than central, and are seldom symmetrically arranged. Nor are they, as a rule, sooty in appearance. We may assume then that any cutting that has been planted for above a week and shows a central sooty-black "pipe," is suffering from pineapple disease, especially if the odor of the more undeveloped part of the pipe is of the character described above; and if the odor is distinctly that of pineapples, or thereabouts, there can be no doubt of the identity of the disease. This makes it unnecessary in many cases to resort to the microscope for a determination.

The onset of the disease is at the end of the cutting, and it proceeds toward the middle along the axis of the cutting, usually from both ends. It appears that the looser axial portion of the cane stalk is that most suitable for the development of the fungus, no doubt on account of the presence of air. Finally, of course, all parts of the cutting except the rind are attacked. The softer varieties like Lahaina, Rose Bamboo and Striped Singapore are reduced to a mass of black fibres contained in a thin shell, for the rind resists decay much longer than the center. If the variety has a thick and tough rind the "pipe" is more pronounced and is confined more nearly to the axial region. This is true of Yellow Caledonia.

The disease is not known to have the power to enter the sound tissues of cane or other plants. As it always enters through some break or wound, it is ranked with the wound parasites. So far as cane is concerned the "wound," in most cases, is the cut surface of the cane, the disease being largely confined to attacks on cuttings after they are planted.

PROGRESS OF THE DISEASE.

In its progress through the cutting the fungus has to pause at each node on account of the extra density of the nodal tissues. After struggling through the node it again makes rapid progress until it reaches the next node. The entrance to a new internode is usually marked by the appearance of pink or red elongated streaks in the central tissues of the cutting, and these colors may extend in a modified degree to the marginal parts. It is during the accelera-

tion of the disease due to its entrance into a new internode that the odor reaches its maximum. In the softer varieties of cane the odor at this stage is strong and almost penetrating.

MICROSCOPIC TEST.

The most decisive test of all, of course, is the microscopic examination,—in fact, in some cases it is the only certain criterion. If the spores of the fungus can be obtained, the identity of the disease is at once put beyond question.



Fig. 2. Macrospores of the Pineapple Disease *Thielaviopsis ethacetica*. It is these spores which impart to the tissues attacked by Pineapple Disease the characteristic dark color. These spores do not germinate at once but require a period of rest.

The sooty black appearance of the central tissues is brought about by the formation of dark-colored spores on the ends of certain mycelial branches. These spores appear only after a certain length of time, and it is therefore desirable to be able to recognize the fungus in its mycelial stage. This is not difficult. There are a number of fungi that attack cane cuttings, but of all these the mycelium of the pineapple fungus alone has certain fairly well defined characteristics.

The microscopic test is conducted as follows: Search for tissue that appears to have been darkened by the disease, and from such

tissue scrape away some of the loose dark portion with a clean tool and mount it in clean water and search with a moderately high power of the microscope for the characteristic spores of the fungus.

If the tissues are only recently invaded, it may be that no darkening has yet taken place. In that case the darkening may be quickly induced by giving the tissues access to air. If a cane cutting in the early stages of the disease, while its tissues are still only in the red stage, be split open and put back together and laid in a still place, such as a drawer, in the course of twelve hours its tissues will often assume the dark appearance due to the formation of the macrospores of the fungus. These spores may then be examined and the diagnosis thus completed several days earlier than would otherwise have been possible.



Fig. 3. Microspores of the Pineapple Disease *Thielaviopsis ethacetica*. These spores are smaller than the macrospores and more transparent. They are also produced in a different manner, as shown in Fig. 4, arising inside the mycelium and being pushed forth from the broken end of mycelial cells. These spores germinate at once and serve to keep the disease in active propagation. Their existence is a transient one.

The structure of the fungus is such that apart from the formation of the spores it may be provisionally identified from the mycelium. This arises in most cases from the germination of the microspores or the macrospores. It is not often, in all probability, that the disease is transferred from one host to another by means of the mycelium.

The microscopic appearances of the various parts of this fungus are well shown in Fig. 4. The mycelium, at first colorless, becomes at last light to dark brown, though never of the latter color except in the fully decomposed tissues of the heart of the cane. In the partly discolored and the reddish tissues associated with the onset of the disease the mycelium is nearly always colorless. The mycelial cells are from three to ten or more times as long as broad, and contain refractive bodies, more particularly in the neighborhood of the spore-bearing branches. It varies in thickness from three to eight micromillimetres, and is extensively branched, the longer branches naturally lying in the same direction as the axis of the cane.

APPEARANCE OF THE SPORES.

The thin-walled microconidia, which germinate so easily and hence serve to spread the disease rapidly, are formed in

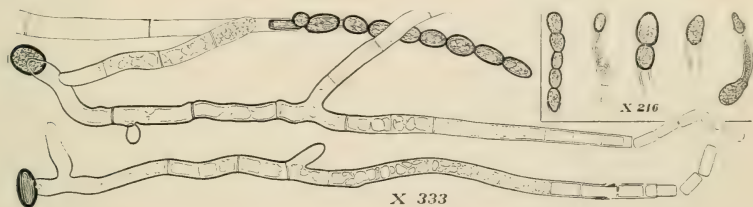


Fig. 4. Mycelium of the fungus causing Pineapple Disease, *Thielaviopsis ethacetica*. This mycelium is abundant in the pinkish, reddish, brownish and black tissues of cane attacked by this disease. It is a well characterized mycelium and it is possible to identify it with some degree of certainty, especially by means of the following test: If the fresh tissues containing the mycelium be cut open and exposed over night to the air in a moist situation, the mycelium rapidly produces the dark colored macrospores characteristic of this fungus.

The larger figures are taken from a hanging drop culture, while the figures in the rectangle in the upper right hand corner are taken from specimens found among cane tissues. Two spores are shown to have germinated in the hanging drop culture and to have begun the production of chains of microspores as described in the text. Above may be seen a chain of the darker colored microspores mentioned in the text.

The five figures in the small rectangle may be described in order thus, beginning at the left: First, a chain of the elliptical darker colored microspores; second, a macrospore proliferating; third, regular formation of macrospores; fourth, single microspore in process of formation from inside a small branch of the mycelium; fifth, spore germinating and producing a single microspore.

the cells of special nearly colorless branches of the mycelium about one hundred micromillimetres long and of varying diameter according to the part measured, being widest considerably behind the middle (8—10 micromillimetres) and from

thence tapering to the open end from which the microspores are escaping. These are cylindrical, nearly colorless, measure about five micromillimetres in diameter by ten to fourteen micromillimetres long, and occur in or outside the cells of the mother mycelium in numbers up to twenty, but generally less than half this number. These spores are sometimes seen to be of smaller size, ellipsoidal form, with a thicker wall and darker color. These dwarf spores are, however, produced row-wise inside the cells of the mycelium, and all possible intermediate stages connect them with the regular microspores.

The dark-colored macrospores, which in the later stages of the attack impart to the diseased tissues their dark color, are borne in an entirely different manner and have an entirely different function. They are far larger than the microspores, measuring $10-12 \times 16-19$ micromillimetres, and are more or less ellipsoidal in form. The brownish to blackish wall is thick and impervious. The ends often indicate the position of the previous attachments, so that the contour is not exactly ovate or ellipsoidal. Though these conidia are usually borne in chains at the ends of special branches it is not infrequent to find them borne singly. This is usually brought about, I think, by the falling away of all the members of the chain except the proximal one.

The microconidia germinate promptly and easily, merely in the presence of moisture. The macrospores germinate with much greater difficulty, and only after a period of rest.

From this quotation the reader may acquire a very fair idea of the fungus as it occurs in cane. The characteristic pipe mentioned in connection with the stalk of the cane plant is never seen, of course, in the pineapple. Moreover, the rot presents certain peculiarities in the pineapple that call for special mention. These points will now be taken up and discussed in order.

THIELAVIOPSIS IN PINEAPPLE.

Taking sections of one of the carpels at a point a few millimeters from the surface of a pineapple that has only just begun to show traces of the sooty blackness due to the formation of the black macrospores, and at a distance of two to four inches from the dark macrospore formation, one may see that the already watery tissue is mainly composed of the mycelium of the *Thielaviopsis*. The mycelium is easily distinguished, as it is darker in color than the other tissues and than most mycelium. In this colorless part one may see that the formation of the microspores precedes that of the macrospores.

The microspores arise in the mycelium of lesser diameter, and appear to form first in the vicinity of the vascular tissue of the pineapple. The rather dark mycelium, which owes its color partly to the refractive nature of its numerous granules, gives rise to colorless elongated non-granular microspores, each generally with a single excentric refractive body.

A remarkable growth of the microconidia was produced by the following procedure. A pineapple so far rotted that the macrospores had appeared for about an inch at the base of the core was halved by an axial longitudinal cut. An examination of the tissues showed that the mycelium was present in great quantities even near the surface of the rind almost to the very tip of the fruit. The tissues were watery and the juice of the fruit was exuding on to the surface on which the pineapple lay. The fruit was so soft it had to be handled carefully in making the section to avoid breakage.

After eighteen hours a frosty-looking growth had appeared on the cut surface of the pineapple, which had meanwhile lain exposed to the air. The first thought was that the growth was immature penicillium, but a casual glance threw doubt on this supposition. Then, for an instant, I wondered whether crystallisable salts in the fruit had possibly crystallised and formed a surface incrustation as a result of evaporation. These random thoughts are mentioned merely to illustrate the appearance of the growth. An examination showed that this growth was purely microconidial and *aerial*. The chains of spores were either isolated or grouped in contact, and the depth of the growth was fully one millimeter at its deepest part. The appearance under a two-thirds objective was that of a deposit of hoar frost. At the base of this growth of microconidia, and in the wet tissues of the pineapple, the macroconidia were in process of formation, and many were already fully formed, so that the tissues acquired a dark color.

The appearance of the chains of microconidia was not that ordinarily seen when these are produced in the tissues of the fruit. Under such circumstances the conidia are to be seen forming in the mycelium of the fungus, and after they are complete they are pushed forth from the ruptured ends of the cylindrical mycelium. The walls of the spores can be seen to be entirely separate from that of the mycelium. In the case of these aerial microconidia, however, the appearance was entirely different. The conidia were in moniliform chains of the most beautiful regularity, the spores remaining joined at the central part of the area between them, so that the appearance was that familiar in the case of the aerial conidia of *Sphacelotheca pannosa* and other Erisyphaceae. Outside these

chains of spores no mycelial wall was to be seen. In fact, it appeared that the spores had formed merely by the segmentation of aerial mycelium, which, however, originated internally from other mycelium. For these spores the name aerial conidia is at once descriptive and noncommittal. It is evident to me from my studies of this fungus that its various forms and activities are as yet but imperfectly understood.

The further history of the aerial conidia is as follows: In the course of twenty-four hours the white coloration due to the mass of these spores becomes darker owing to the slight darkening of the spores themselves, but more particularly to the growth of ordinary macrospores from the mycelium below. The chains of aerial conidia placed in water no longer remain intact. They break up almost without exception. The spores

		have the dimensions shown in the adjacent table. If
7.5	3.95	they are placed in proper nutritive fluids they
8.5	5.7	germinate promptly. The first indications of
7.5	3.95	germination is a change in the form of the spore,
8.9	5.45	by which it becomes nearly spherical. It then
7.9	6.8	germinates from what was the side or the end of
5.7	4.2	the spore, apparently more often the side. It is
7.1	7.1	often difficult to say what part of the spore pro-
10.9	6.3	duced the hypha, so perfectly round do they be-
9.5	5.45	come before germination. In the course of 12-15
10.2	4.9	hours the mycelium, which is colorless and more
<hr/>		or less regular in form and direction up to this
8.4	5.4	stage, may be 25 times as long as the swollen spore
		is wide. The mycelium is septate, the cells being
		5-15 times as long as wide, and each hypha containing several
		such cells. Up to this stage the hyphae are little, if any,
		branched. The present description is made from the
		germination of spores that had passed through the intes-
		tinal canal of <i>Eristalis punctulatus</i> , Macq., the commonest
		Syrphid fly around Honolulu, but there is no reason to sup-
		pose that the germination of spores that had passed through
		this insect would present any peculiarities worth mention.

THIELAVIOPSIS AND FLIES.

If some of the sooty black mass be taken from a pineapple and be forced gently through the meshes of the finest miller's silk sieve, that is, a sieve of about 100 microns square (1-250 inch) in the clear, the macrospores may be separated out in considerable purity. By accumulating these spores in a watch glass of water, and assembling them with the aid of sedimentation and rotation, it is very easy to procure them in such numbers

that every small drop of 10 milliegrams weight will contain thousands. Using such a concentrated spore sediment as a solvent for grains of sugar it is not difficult to prepare a fly-food such that if the spores survive fly digestion it is easy to test their subsequent germination. As a matter of fact, some flies exercise a considerable choice in the size of the solid particles that they ingest. They are supplied with a sifting apparatus by the aid of which they can exclude particles exceeding certain dimensions. It appears, however, that the

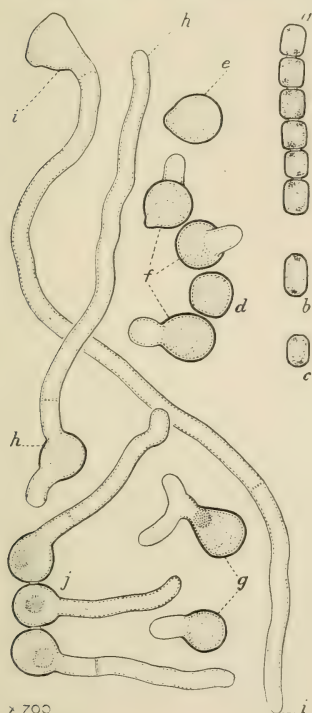


Fig. 5. Explanation of the figures of aerial conidia of *Thielaviopsis*.

Eleven spores germinating, and eight that have not yet started to germinate. *a*, a chain of six aerial conidia as they occur when attached to the parent mycelium. *b*, *c*, two spores showing some of the extremes of size and form; *d*, a spore that has swollen and become somewhat spherical preparatory to germination; *e*, a spore that has become spherical and started to send forth mycelium at the left hand side; *f*, three spores a stage farther advanced than that at *e*, these three spores being part of the same chain as that marked *d*, but all now separated; *g*, two spores still farther advanced than those at *f*, one of them having started to branch at a much earlier stage than is usual with this species; *h*, *h*, spore whose hypha has one septum; *i*, *i*, spore whose hypha has two septa; *j*, three spores still attached to each other that have nevertheless germinated.

The spores *a*, *b*, *c*, have been mounted in water and drawn at once. The remaining spores have been passed through the fly *Eristalis punctulatus*, a common Syrphid fly, and afterward germinated in pineapple juice. The passage through the fly makes no difference in the germination of the spores. The spores *a* to *c* would, if placed in pineapple juice, germinate in precisely the same manner.

macrospore of *Thielaviopsis* is somewhat below these dimensions. At any rate, the spores are ingested by various common species of flies belonging to the Muscidae, Sarcophagidae and Syrphidae. All the species I have tried are such as normally search out and prefer saccharine food. These take in the *Thielaviopsis* spores with sugar solutions artificially prepared as described, and the spores pass through the insects with little if any apparent alteration. From one to a dozen or more spores are to be found in each portion of excrement

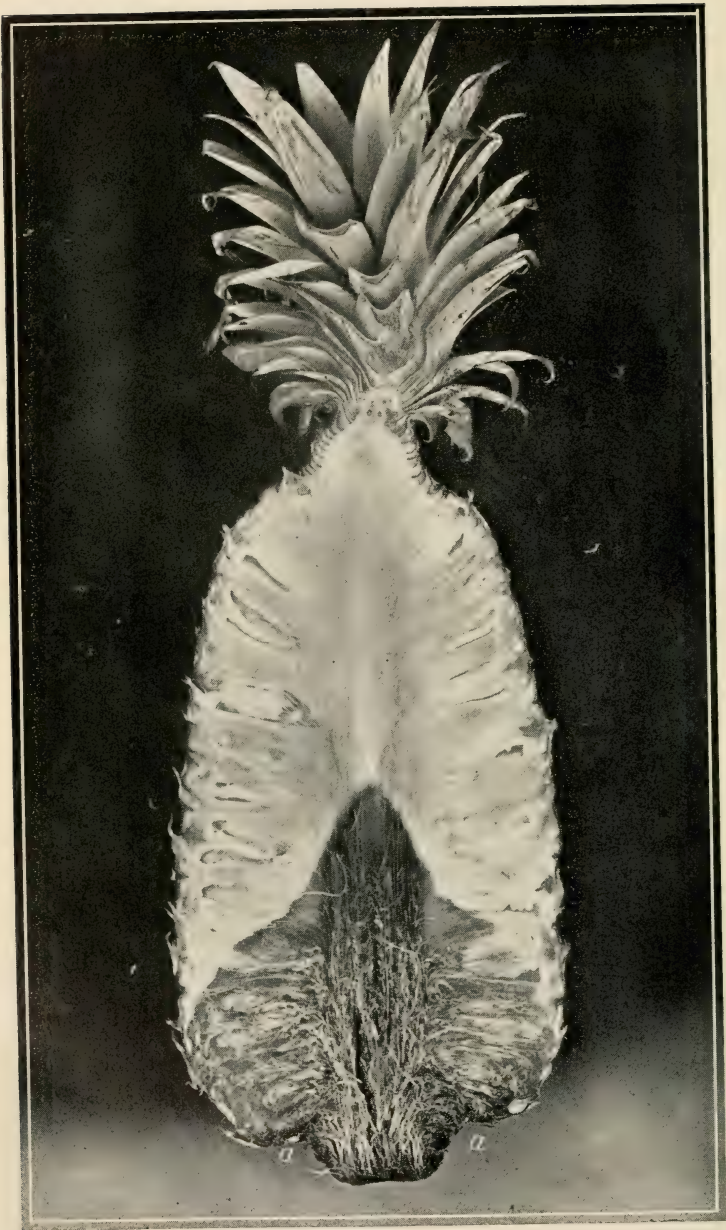


Fig. 6. Diseased pineapple about one-third natural size. *a, a*, angle at the base of the fruit where the disease found an entrance owing to the presence of insect wounds; the dark portion shows the nature of the advance of the rot upward through the fruit. The dark color is due to the formation of the black macrospores of the rot-fungus, the mycelium of the fungus being really considerably in advance of the dark coloration; *b*, apex of the visibly rotten part. It will be noted that the fungus advances most rapidly along the fibrous part of the fruit.

passed. Some of these spores are broken, but no greater proportion than before ingestion. The breakage is due to the treatment with the sieve. Even the microspores appear in the excrement apparently unaltered. In the same manner the aerial conidia of this fungus collected in water slightly sweetened may be fed to flies with the result that they pass through the alimentary canal unaltered.

All these spores germinate readily after passing through the canal of the flies. It appears to make little difference what fly is used so long as it is a species that is accustomed to seek saccharine fluids as food, or is omnivorous and accustomed to saccharine food. In all such cases the spores, if passed through the fly in what seems to be the normal way, will germinate afterwards. If the fly has a good supply of food, in other words, all that is desired, the passage of the food through the most common species requires only a short time. The principle of the fly's digestive economy seems to be the use of large quantities of food and the absorption of only what is readily soluble. Thus, in the case of spores placed in sweetened water, only the saccharine matter is absorbed. The spores, even when they are rather frail and thin-walled, suffer little if any diminution in vitality by passage through the fly. *The consequences of the general statement thus made are almost beyond conception. The relations of flies, not only to the pineapple disease, but to diseases of all sorts, is thus shown to be of the very greatest importance.*

The location of the pineapple rot is largely determined by insects, and its spread from one plant to another is largely the result of insect work. The mealy bug, as it is called, of the pineapple naturally seeks protected places where it can find food of the right nature. The protected places are the lower angles between the carpels on the lower part of the fruit and beneath the lower leaves of the top. At these points it seeks out the tender places where it can insert its proboscis for the purpose of sucking up its food. As the fruit grows there is a gradual opening out of the angle between the carpels by which new epidermis not hitherto exposed comes to the light and air. It is through this tender epidermis that the insect prefers to insert its proboscis. At the apex of the fruit, just below the lower leaves of the top, is another location where the insect finds similar congenial conditions. The location of the insect determines to a considerable extent the cracking of the fruit, and it is through the cracks following on the results of the insects' punctures that the rot finds an entrance. Hence the rot is most common at the base of the fruit and at the top. Occasionally the blossom end of a carpel will be suffi-

ciently open to allow the entrance of one of the young insects, so that we find the blossom cavities not infrequently inhabited by the insect. But this is not so common nor so injurious a feature as those just mentioned.



Fig. 7. Slice of pineapple from a tin that had "gone bad." It will be noted that there are dark stains to the number of about ten. These stains correspond in position with the bundles of fibres that pass to the different carpels of the fruit. This again shows the tendency of the rot to pass most rapidly through the most fibrous tissue. It is not certain that this slice was affected with the *Thielaviopsis* fungus.

From these facts we may draw most important inferences as to the treatment necessary in order to prevent the attacks of the rot. The problem involves entomological as well as fungus factors, as is not infrequently the case when we come to study the full life history of a fungus.

First let us deal with the entomological part of the problem, as that is more easy of comprehension, in that it deals with an organism apparent to the unaided eye. If one looks attentively at a pineapple, and especially if he takes the trouble to probe a little with a pocket knife and to look about with a pocket lense, he will easily confirm what has been said as to the habitat of the mealy-bug of the pineapple. It is most abundant at the base and at the top of the fruit. At the top it is the habit of the insect to push its way into the axils of the leaves, and as one removes leaf after leaf at the base of one of the

tops he will be surprised at the narrowness of the crevice into which one of the flat young larvae of the insect can crawl. It is perhaps for this very purpose that the young insect is so very flat.

Observe how important a factor this is in the life history of the insect. All the young insects that have the instinct to force their way in among these top leaves stand a good chance to be transplanted along with the top. When the top is planted in a new field it takes root, and as it grows it gives rise to new parts that accommodate the insects, so that these latter propagate to advantage. It is for this reason that the bulk of the insects are to be found at the base of the fruit. A few of them, however, wander to the top, and it is these that help carry the blight over to the next crop of pineapples.

The precaution suggested by these facts will by this time have become patent to any reader. When the tops are removed for the purpose of planting out, the greatest care should be exercised to see that none of the scale insects are transplanted



Fig. 8. Top pulled from a rotten pineapple to show that the tissues of the top are subject to the attacks of the *Thielariopsis* fungus. *a*, *a*, sound tissue of the top; *b*, black fibers pulled from the rotten part of the pineapple and carrying multitudes of spores, so many that the fibers are black with them; *c*, point to which the discoloration due to the rot extends; the fungus mycelium, that is the disease, will be found some distance in advance of this point. It is to be hoped that such a top as this would rarely be planted, even after the most severe trimming. The point to be specially noted is that the tissues of the top are subject to the disease. Here we have them attacked. If they are subject to the diseases, they are liable to contract it after being planted, if the soil happens to contain the spores of the fungus.

at the same time. Remove as many leaves at the base of the cut-off top as may be necessary to secure this end. It is better to waste the top than to run the risk of planting out the blight. Any practical person can satisfy himself of the utility of this precaution wherever the insects are abundant if he will take the few minutes' trouble necessary to make the pocket lens examinations described.

Now the ultimate result of this precaution is the prevention of a large amount of rot. The damage the insects do is not so very apparent to the ordinary observer. I think most of the growers with whom I have conversed have shown a comparative disregard for this insect. The losses from it appear to them to be slight. Occasionally a pineapple looks bad with the blight caused by this insect, but the number is not so great as to cause much anxiety. However, when the fruit is shipped, and rots on the way to market, questions begin to arise. Now, the answers to these questions lead back, as we have seen, to this insect. The rot is caused by a fungus, possibly by more than one fungus. But it is the insect that brings the pineapple into the condition that gives the fungus its best chance. No doubt the fungus would in any case ultimately find its way into the pineapple; still, the insect helps it to find a way in much quicker than would otherwise be the case.

Another point to be attended to by the provident planter is the complete destruction of pineapple refuse. All such refuse contains the material necessary to start the disease afresh in new fields, and it is truly wonderful the number of ways in which this may occur. Spores are minute things,—too small to be seen by the unaided eye. Their abundance is enormous. It is indeed difficult to overstate their abundance. Almost any moving object will be found more or less likely to carry them from place to place. They become detached from their place of origin and are washed away by water, or lifted by the wind, whirled aloft and it may be scattered for miles around. Failing this they may be carried by moving animals, including insects and man. The ubiquitous fly carries all sorts of minute objects of this kind on its feet. There is a small beetle that is almost invariably found in rotting pineapples. This beetle daubs itself with spores and in passing from one fruit to another it carries the spores of the fungus, causing the pineapple rot. This chain of thought might be carried out to an almost indefinite extent. But enough has been said to indicate its importance.

The "mealy-bugs" are attended by ants. I am not aware of the precise relations between the ants and this particular species, but

it is known that in some cases the ants take the trouble to carry aphides from place to place in order that the aphides may thrive. Thus when the pasturage for the aphides becomes poor, the ants remove them to better feeding-grounds.

Whether these mealy bugs wander from the base of the pineapple to the top in order to establish new colonies I do not know. It is possible that they may be carried from the base to the top by ants. Such a thing would be no more wonderful than many of the things ants are known to do in this connection.

At any rate, it is certain that the mealy bugs in some way find their way from the base of the pineapple to the tip.

PINEAPPLE ROT.

(That is *Thielaviopsis ethacetica*, Went.)

Pineapples carried off by *Thielaviopsis* often rot from the top. In this case the fungus makes its way down into the pineapple by way of the fibers of the core, as may be easily seen when the characteristic black color develops. The same or similar phenomena occur when the rot makes its way in at the side of the fruit, as it less frequently does. The reason the rot enters at the bottom or the top has already been indicated. It is because the insect attacks, apparently necessary as a preliminary, occur principally at the bottom and the top of the fruit.

In its final stages, a fruit that has rotted from above will permit of the easy removal of the top. It pulls away easily and the black fibers of the core of the fruit come away like a sort of root system. This is shown in Fig. 8, which illustrates, in an exaggerated way, what may take place in using tops for new plantations. In the case illustrated there would be no question in the mind of anyone that some of the rot is taken away with the removed top. It can be seen. Now, if in such a case the lower part of the axis of the top be examined it will be seen that the rot ceases a little way into the top. The black color of the rot can be seen in the hard tissues of the center of the top. The fungus actually extends some distance beyond the black coloration. This is an important matter to understand, because it shows how a planted top may contract the disease. It may even be that through carelessness such a top with rotten tissue at the bottom is planted. The more important thing to note, however, is that this observation proves that the *axis of the top can contract the disease*. The tissues of this part of the pine-

apple are such that they afford a suitable food for the fungus to grow in. Not perhaps the best of food, but, at any rate, such that the fungus can live. Now, if that is the case, it is evident that any top planted out in an infested field stands a chance of contracting the disease. In just such proportion as its tissues are suitable food for the fungus, in that proportion it will be liable to become diseased if it is exposed to the fungus. *This shows how important it is to keep the soil of the pineapple plantation as free as possible from this fungus.*

It will be noted that the fungus does not penetrate beyond a certain distance into the top. From this it is evident that at a certain point the tissues become less suitable to the fungus than they are lower down. From this we may correctly argue that, when planting, the removal of the tissues from the lower part of the pineapple top is a wise precaution, as the lowermost tissues of the new plant will then for some time offer some resistance to the attacks of the fungus should it be present in the soil.

THIELAVIOPSIS AND BORDEAUX MIXTURE.

Experiment has shown that cane cuttings can be protected from the bad effects of pineapple fungus, that is *Thielaviopsis*, for weeks, or, it may be, months, in some cases, by the application to their ends of fungicides such as Bordeaux mixture or tar. The facts of the case are presented in Bulletin No. 5 of the Hawaiian Sugar Planters' Association, Division of Pathology and Physiology, to which the reader is referred.

Field inoculation showed the power of the *Thielaviopsis* of the pineapple to infect cane cuttings, so that there is no probability that the two sorts of *Thielaviopsis*, that is, that from the pineapple and that from the cane, are two different races. They are one and the same, and hence it follows that in all probability the experiments carried out at the Planters' Experiment Station are directly applicable to the pineapple. This means that the rot can be prevented from entering the pineapple "set" for some time by simply smearing the cut end with Bordeaux mixture or tar. It is probable that in time, even if not at present, this is an operation that will pay well, for the reason that it will enable the "set" to establish itself to better advantage. The pineapple tops need not be dipped—only smeared at the cut end.

ROTS OF THE PINEAPPLE AS AFFECTING THE TINNING OF THE FRUIT.

There are a number of rots of the pineapple that affect the fruit in such a way that it often comes to the factory for tinning in a state that calls for special action. If the fruit is attacked in one small part only and the rot is in its initial stages, it may be possible to utilize the portion of the fruit not attacked. Such fruits naturally will form a second-grade product.

Another question of importance in this connection is the transition of the fruit from a ripe or healthy condition to the rotted condition. This change may be of such a nature that it is not easy to detect the early stages of the rot. In such cases there is danger that fruit in the incipient stages may find its way into the first grade. In appearance it may be up to grade, but the presence of the rot, though it may not affect the appearance, does affect the flavor. The lack of bouquet, or it may even be bad flavor, develops after the fruit has been canned for some time, when the evil has spread from one or two bad slices or places to the other parts of the tin. It is important for the consumer, as well as the packer, to know the appearances that indicate an unsound tin of pineapple.

It is usual to speak of tinned pineapple of the kind as "over ripe." This is only another way of saying that it is infested by some fungus of microbe,—in the case of pineapples, probably some fungus.

The golden rule is to become familiar enough with the appearance of first-class fruit to know it at sight, and to be very suspicious of anything that has any other appearance. This is possible for the packer and his employes, but it is not an easy thing for the consumer, who, it may be, buys only occasionally. The accompanying photograph shows the appearance of fruit of second quality or deleterious quality.

EXAMINING PINEAPPLE THAT HAS BEEN CANNED.

The examination naturally is directed toward the isolation of any fungus elements that may exist in the discolored areas. At first the cellulose walls of the pineapple cells present appearances that need to become familiar to the observer. Then the nuclei of the pineapple cells simulate organisms in some instances. The granules of the protoplasm also simulate microbes. After one has become familiar with the more or less deceptive appearances he is ready to go on with the search for the traces of deleterious organisms.

Where the cell nuclei of the pineapple are unaltered, and the granular appearances indicative of the protoplasm are present, one naturally does not expect to find traces of such organisms in abundance. On the contrary, where the cell nuclei are absent, and the cells show other indications of disorganization, there the observer pauses to look carefully in the hope of finding the culprits that are responsible for the poor quality of the pineapple or the "going bad" of the tins.

One of the most abundant organisms in tins that have swollen or have burst through the action of ferments are the yeast organisms and similar cells. These will be present in all tins that have the ordinary odor of fermentation. In cases where the odor differs from this characteristic, alcoholic or sour odor of fermentation, the organisms will be different and may even in some cases take on the character of mycelium.

It is not often, however, that one may expect to find living mycelium. More often the mycelium will be such as was present before the cooking process, and therefore such as has been altered by that process. In general, the stained portions where the cells are most altered have a definite relation to the location of the fibrovascular bundles of the fruit. The axis of the pine is composed largely of fibers or fibrovascular bundles. From place to place the central bundle of fibers gives off groups of strands or fibrovascular bundles, these bundles corresponding in number with the carpels or points or prickles on the surface of the fruit. When a slice of pine is discolored as shown in the photograph, it will be found that it is these groups of bundles that are stained, and that the stain is therefore associated with the vascular axis of the carpels. So far as the stains extend, there are as many stains as there are carpels. It is a noteworthy fact that the fungi of pineapple diseases are associated with staining of the fibrovascular bundles, very likely because they have very definite relations to air. Air is present in the bundles, and it is this fact, perhaps, that determines the line of attack of the fungus. When the pine goes wrong from the root end, as is sometimes the case with *Thielaviopsis*, it is easy to see that the effect must be about that seen in the case of the slices that have "gone off" after tinning. The chemical influence of the rot will extend in advance of the rot along the vascular bundles, as in the case of cane and other plants.

In spite of all precautions, it is to be expected that some fruit will rot on the field. What should be done with this rotten fruit? It should be destroyed, by fire or otherwise. Moreover, the stumps of such rotten fruits should be immediately dug up and destroyed at the same time. All the

stumps that are left on the field are more or less liable to take the *Thielaviopsis* rot, and for this reason it is very desirable to remove these stumps rather than let them rot on the field. If they rot on the field they are pretty sure to become a factor in the generation of some disease of the future crop. So long as pineapples are to follow pineapples, the greatest care should be exercised to *keep the fields clear of rotting or decaying parts of pineapple plants, whether fruit, leaves or roots.*

The industry is expanding rapidly in Hawaii, and in consequence tops are worth two or three cents each. All tops that will grow are being used, to a large extent, regardless of whether they are diseased or not. If the top fails it is replaced by another. This at first may seem to be an economical operation, as it gives the poor top a chance to show what it can do. If it fails, another can be put in. But the *ground at the place of this failure becomes infested*, hence the practice is a bad one, taking the future into consideration.

The old stumps are for the most part being plowed in. This is a bad practice where pineapples are to be followed by pineapples. Examination of the old stumps shows that they are infested with fungi, among which is *Thielaviopsis*, and when this is the case this disease is being encouraged by allowing the stumps to remain. There seems to be some little attempt to burn the trash, but too little. All pineapple trash is inimical to subsequent pineapple crops.

Where the water stands about a plant in the early stage, before it has established itself, the plant suffers and often dies. This is due to disease, often *Thielaviopsis*, entering at the base and getting ahead of the roots of the plant. Proper drainage will remedy this local dying off of young plants.

On some low lands the plants become yellow and die off, or, at least, do not do well. This is a separate malady. The soil at Wahiawa, Oahu, is said to lack lime. If this is so, liming should be tried, especially at the low and poor patches.

Plants occasionally die from the attacks of one or more fungi on the leaves. For a long time in advance of the actual appearance of fungus fructifications these diseased leaves may be picked out by their different color. The attack begins at the tip of the leaves and works back. In any event, sooner or later, these fungi attack the leaves, and it is probable that a closer study of some of them might disclose facts of importance in reducing losses. I have made a number of notes regarding some of these fungus species which may be worthy of publication at some future time.

It is evident that at Wahiawa the common ripe rot of the pineapple is *Thielaviopsis ethacetica*.

Carpophilous beetles are very common, and these, no doubt, spread the *Thielaviopsis*, as is the case with this fungus in cane fields. If old stumps and worthless fruit were promptly destroyed, the beetles would be less harmful in spreading this fungus.

Flies are very common about the canneries, and no doubt serve to spread some of the diseases, as noted on pages 130-131. It is very difficult to see how they can be kept out of the canneries without expensive screening. The neighboring stables are fine breeding places for flies. The dung heaps should be screened, or, at any rate, so treated as to reduce the flies. This is an operation that will amply repay the cost.

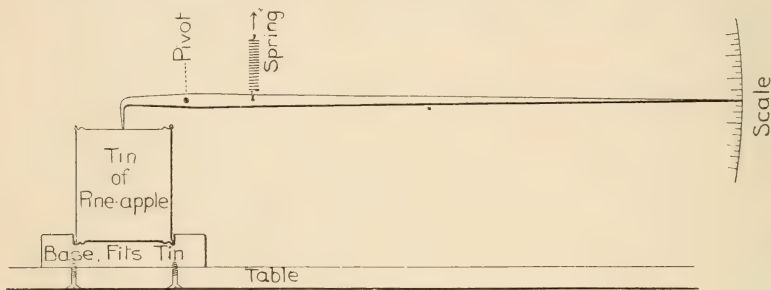


Fig. 9. Sketch of a caliper for tinned fruit.

In the course of my investigations on tinned fruit it has been necessary to know what tins were swelling, and the rate of swelling. The accompanying figure will illustrate the nature of an apparatus I have devised for this purpose. It is simply an application of the ordinary, spring micrometer caliper. Such an instrument may be of use in pineapple canneries, and for that reason the illustration has been inserted. The tin to be adjusted is placed on a base which fits it and holds it in such a position that one end of the caliper lever touches the center of the top of the tin. It is necessary that this adjustment be such that whenever a tin is reinserted in the apparatus, so long the tin remains constant the caliper point will assume its former position. The apparatus will be readily understood from the lettering. The caliper lever is pivoted so that the short arm is next the tin to be tested and this arm may be made any number of times shorter than the long arm which swings past the scale. The scale may be arbitrary or it may be made to indicate a given length of tin, the zero of the scale being naturally the upper surface of the baseboard which receives the tin. The apparatus should be constructed of light metal and be of such character as to be permanently accurate. It need not be expensive. Such an instrument would be of use to the Manager of a cannery in investigating the rate at which tins of pineapple change owing to the various circumstances that occur during the manufacture and trade in his product.

COLLEGE OF AGRICULTURE AND MECHANICAL ARTS.

APPOINTMENT OF THE BOARD OF REGENTS.

The Governor has appointed the following Regents of the College of Agriculture, who have been confirmed by the Senate: Messrs. W. G. Smith and A. Gartley for the term of three years; Messrs. Marston Campbell and C. F. Eckart for two years and the Hon. H. E. Cooper for one year.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906. Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

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Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. IV

JUNE, 1907

No. 6

OUR NEW COLLEGE OF AGRICULTURE.

ITS WORK, OPPORTUNITY AND FUTURE.

Farmers' Institute Meeting.

The recent action of the legislature in setting aside an appropriation to found a College of Agriculture and Mechanic Arts in the Territory, was the occasion of a special meeting of the Farmers' Institute of Hawaii at Oahu College, on May 25th last. A representative gathering of prominent agriculturists and educationalists was in attendance, and the future sphere of work of the new institution was fully discussed. Among the speakers of the evening who had kindly consented to present certain phases of the subject were members of the Board of Regents of the new College, the President of Oahu College, the Principal of Kamehameha Schools and other gentlemen. The following addresses were delivered:

MODERN AGRICULTURAL EDUCATIONAL IDEALS.

By Jared G. Smith, President Farmers' Institute of Hawaii.

The land-grant colleges, established by the Morrill Act of 1862, are in every instance a joint product of the Congress of the United States, and the legislature of a given State, that is, of the Nation and the State combined. The Morrill Act of 1862 prescribes the scope of instruction at the college as being: "Without excluding other scientific and classical studies, and including military tactics;" to teach "such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The second Morrill Act of 1890 provides for education in "agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic sciences, with special reference to their application in the industry of life."

Senator Morrill, the author of the organic laws under

which these institutions have been established, has in his public writings often voiced his own interpretation of the original intent of the laws. He urged that the object of these colleges was "to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and the mechanic arts, such as they could not have obtained at the classical colleges. It was never intended to force the boys of farmers going into these institutions so to study that they all should become farmers. It was merely intended to give them an opportunity to do so, and to do so with advantage if they saw fit." I quote again, "The Act of 1862 proposed a system of broad education by colleges, not limited to a superficial and dwarfed training, such as might be supplied by a foreman of a work shop, or a foreman of an experimental farm." "If any one would have only a school with equal scraps of labor and of instruction, or something other than a college they would not obey the national law."

The College of Agriculture of Hawaii is the forty-ninth institution to be established under the general provisions of the national organic laws. The agricultural college is of necessity a part of the public school system of the Territory. It is "the people's university." Some of its requirements are that tuition shall be free to students resident in the Territory, or as nearly so as conditions will permit. The course of study must be such as to meet the wants of the people at large. "Whatever limitations other institutions may with propriety prescribe, this Agricultural and Mechanical College must have regard to what the people want to know and to do." The public high schools and preparatory schools should be accredited or approved by the college in so far as their work is worthy of approval, so that good students upon completing their studies in the secondary schools may find a natural entrance to their college unobstructed by terrifying examinations. A close, intimate, and friendly relation with the secondary schools must be maintained. The college should stand for the best ideals in education from top to bottom, and it should make higher education as attractive as possible to the average citizen. Its relation to the public school system is simply to complete the work already begun; to gratify the ambition already inspired, and to make of the average man who wishes it, a strong, capable, useful, high-minded, broad-visioned citizen. Training for mere manual skill should be eliminated from courses that lead to degrees. Not one of the mainland agricultural colleges now require compulsory manual labor. The labor now required in agricultural colleges is on an educational basis, mainly laboratory work.

The ideals should be high. The institution established by the Legislature of 1907 is fortunate in that full and complete

advantage can be taken of the experience, failures and successes achieved during the last forty-five years by the older colleges on the mainland. The key-note of the whole system of the State Agricultural Colleges is that which is emphasized in the fundamental law that the education must be a *liberal* one. The ideal should not be to train the men and women to fill some particular niche in life, but to produce, rather, broad and well rounded men, capable of succeeding in any walk of life. As a dual organization having a direct relationship with both State and Nation, it must give its students training in the humanistic as well as the most advanced technical ideals. As a prominent educator has recently said, "there is too much illiteracy among college graduates." Scientific teaching is essential, but the foundation should be upon broader lines, so that the product shall not be a half-educated specialist;—teaching the students that "the only way to have the good opinion of all the people all the time is to deserve it; and that the only thing of permanent value in the universe is character." A liberal education must embrace an acquaintance with some other languages than our own, in order that we may know how other men think, reason, imagine, or express themselves in oratory and song. The study of literature, to acquaint the student with its buried wealth of thought and life, that he may know mankind at its best; history, for its lessons in humanity, its teachings of law and liberty, motive, passion and action, and the progress and development of human life; political science and economics, that the men who go forth shall become the makers of opinion and a source of action in a free state; psychology and ethics, the sciences of mind, thought, and conduct; military science, because the progress of civilization is intimately dependent upon it; religion, because the thinkers and leaders of our civilization must have that reverence for the divine side of human nature which is the guardian and inspiration of all the rest. These are the broad humanistic studies in the university man's preparation for a full and liberal life.

ACTS FOR THE ESTABLISHMENT OF LAND GRANT COLLEGES.

By Hon. Henry E. Cooper, Regent of the College of Agriculture.

The Agricultural Colleges of today look to the Morrill Act of July 2nd, 1862, as the law that has provided for their organization and maintenance. On the 14th day of December, 1857, Hon. Justin S. Morrill of Vermont, Chairman of the Committee on Agriculture, introduced in the House of Representatives a bill appropriating to the several States a portion of the public lands for the purpose of encouraging institutions for the advancement of agriculture and mechanic arts. Strange

as it may appear, opposition to the bill manifested itself at once and four months after its introduction the Chairman of the Committee on Public Lands, Mr. Cobb of Alabama, reported the bill adversely but it finally passed the House of Representatives by a small majority and passed the Senate in the winter of 1859. It was soon returned, however, with a veto from President Buchanan. In 1862 the same bill was introduced in the Senate and passed on the tenth of June by a vote of 32 to 7. The bill then went to the House. On the 17th of June it passed by a vote of 90 to 25 and on the 2nd of July became a law by the approval of President Lincoln. Under the Morrill Act, the amount of public land was apportioned to each State equal to 30,000 acres for each Senator and Representative in Congress. The lands were to be selected from the public domain subject to private entry and in the event of there being no public land within a State subject to entry, then the Secretary of the Interior issued land script to such State, which could only be located by individuals so that no State could locate or own land within the boundaries of another State. The funds derived from the sale of lands and land script were to be invested in stock of the United States or the States, yielding not less than 5 per cent. interest. The funds so invested were to remain undiminished as a permanent endowment fund, the interest to be used for the maintenance and support of at least one college where the leading subject should be, without excluding other scientific and classical studies and including military tactics, such branches of learning as are related to agriculture and the mechanic arts.

Nearly \$3,000,000 have been derived from the sale of land script issued for the allotment to the State of New York. This fund has been placed at the disposal of Cornell University. Massachusetts was not so fortunate in the disposition of the lands derived under the Morrill Act. The share apportioned to Massachusetts was 360,000 acres and only \$207,000 was realized from the sale of the lands; while Kansas received only 90,000 acres, still by judicious selection of lands, something over \$550,000 were realized from their sale. In all about \$12,000,000 have been realized from the sale of land and land script and something over \$4,000,000 worth remain undisposed of.

The next act of importance was passed in 1887, which has been known as the Hatch Act. This had for its purpose the construction of experiment stations in conjunction with the colleges established under the Morrill Act. Under this Act \$15,000 was made available for each experiment station out of any money derived from the sale of public lands. Under this last act about \$700,000 annually have been expended on

the maintenance and upkeep of the stations in the several States and Territories.

In 1890 another act of Congress was passed authorizing the application of a portion of the proceeds of the public lands for the more complete endowment and support of the colleges of agriculture and mechanic arts established under the provisions of the Morrill Act. By this last act \$15,000 was made available for each college, this appropriation to be increased annually by addition of \$1000 until the total amount reached the sum of \$25,000. Now the Nelson Act provides an increase in the amount of the appropriation to each State of \$5000 a year for 5 years at the end of which time the appropriation will be \$50,000 annually.

The next act which particularly affects our own people was passed by the Legislature of the Territory of Hawaii during its last session. The purposes of the college of Hawaii are to give thorough instruction in agriculture, mechanic arts and the natural sciences connected therewith and such instruction in other branches of advanced learning as the Board of Regents shall from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto.

It was quite natural that there should be a diversity of opinion concerning the purpose of the colleges authorized by the Morrill Act, sometimes referred to as the Land Grant Colleges. It was the opinion of some that they were designed as Manual Training Schools, in other words, to attempt to make farmers of the students without respect to scientific acquirements. The purpose for which the colleges were instituted as intended by the original introducer of the bill, Senator Morrill, may be best explained in his own construction of the act.

His idea was to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and mechanic arts such as they could not then obtain at most of our institutions called classical colleges. It never was intended to force the boys of farmers so to study that they should all come out farmers. Not manual but intellectual instruction was the paramount object. It was not intended that agricultural labor in the field should be practically taught any more than a mechanical trade of a carpenter or blacksmith should be taught. It was a liberal education that was proposed. Classical studies were not to be excluded and therefore must be included. The act of 1862 proposed a system of broad education by colleges

not limited to a provisional training such as might be had in an industrial school.

So much for the present laws under which we are organized and are to act.

We require still further legislation by Congress. Rulings to the effect that Colleges established in Territories subsequent to the passage of the act of 1890 cannot participate in the appropriations, makes it necessary that an enabling act should be passed by Congress making available to the College of Hawaii all Federal appropriations. The appropriation from the Territory will permit of a very small beginning only: \$10,000 for salaries for the biennial period, \$5000 for incidental expenses and \$10,000 for buildings. This will not go very far towards providing accommodation for the many students who will no doubt make application for admission to the college as soon as buildings and teaching force have been provided. What we want is sufficient opportunity to teach the young men and women to be able not only to be successful farmers themselves but to teach others how to avail themselves of the natural advantages which are so little known by those who have not been able to receive a liberal education on scientific lines.

AN INTERPRETATION OF THE ACT.

By Wallace R. Farrington, Editor Evening Bulletin.

As I understand your secretary's request, an interpretation of the act creating this college is to be discussed by me with relation to its historical origin rather than a legal definition.

Since coming to the Hawaiian Islands I have been struck with the lack of opportunity for advanced education for the youth unable to personally afford or borrow the funds for a course at some mainland college or university.

Shortly before the close of the session of the 1905 Legislature I framed the resolution which was later introduced by Representative Coelho of Maui calling on the Commissioners of Public Instruction to investigate the feasibility of securing the Federal endowment for and the establishment of a College of Agriculture and Mechanic Arts. This resolution was passed without opposition by the House of Representatives and was later passed by the Senate with the amendment proposed by Senator Dickey that the Lahainaluna school should be considered in this connection.

As a member of the Board of Public Instruction I was appointed chairman of the committee to carry on this investigation and report. I visited Lahainaluna and after going over the situation confirmed a preconceived idea that it was not

the institution from which the college could be developed. It is doing a good work in its own sphere. Its graduates are equipped to enter the first or second year of the High School. Hence it is in no sense a college nor does it furnish the basis for one. Its attendance of over one hundred students shows that it has a place to fill as an industrial school. It is also distant from the center of what educational advantages we have in the islands, and to try to make a college of the place would be to guarantee a low grade college and spoil a first class industrial school.

Our report was accepted by the Board of Public Instruction and presented to the legislators. The Governor also took an active interest in the work of getting the institution started. A plank in the Republican platform endorsing the project was secured.

While the Legislature of 1907 was in session everything was in good shape except for the framing of the act creating for the institution. This was an all important detail, and we were fortunate in securing the appointment of a special committee from the members of the University Club. This committee consisted of Hon. H. E. Cooper, C. R. Hemenway and R. S. Hosmer. They coöperated with A. G. M. Robertson and the result was the law establishing and the law appropriating for the Hawaii College of Agriculture and Mechanic Arts. The bills were introduced by Senator Coelho of Maui and were, as has been said by Mr. Cooper, passed without opposition.

Some one has said that the act creating this college should be entitled "An Act to Secure the Federal Appropriation for Hawaii." As one of those having to do with the early work for the institution, I desire to "acknowledge the corn." That was exactly what I had in mind and as I read history the Merrill Act was originally passed to inspire the States and Territories to do just what Hawaii has done and what every other State and Territory of the Union did before us.

While this is a meeting of agriculturalists, I do not believe that the scope of this college should be exclusively agricultural. It should be a college of agriculture and mechanic arts in fact as well as name. It must be if we are to obtain the Federal appropriation. It must be if we are to give our youth an opportunity for a liberal advanced education.

Nor am I altogether in sympathy with the idea that this institution will not be doing its work unless it turns out farmers. I am convinced that each man should determine for himself his future field of work. I shall not consider this college a failure if it turns out more chemists, or mechanical engineers, or civil engineers, than farmers. There is as much reason to claim that a man should put hayseed in his hair and fertilizer on his feet in order to be at home in a farmer's in-

stitute meeting, as to hold that this college must produce only farmers.

I think this college should be in Hawaii what similar colleges are and have been on the mainland—an institution where the young men and women can obtain a college education and follow the course of study that best suits their ambition.

Presumably future legislators of Hawaii will rise up and cry out as they have done year after year in my home State, "Where are your farmers? Where are your farmers?" The college will fill its mission if it turns out well educated men and women, whether they elect to go into the cane field and hoe, or into the chemical laboratory. Its purpose should be to furnish the opportunity for advanced education. If this be satisfied I am willing to leave the rest with the young people of our Territory. I believe the college will be here as elsewhere in the country—a perfect success.

EDUCATIONAL STANDARDS FOR THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

By Arthur F. Griffiths, President Oahu College.

The more I consider this problem of the founding of the new College of Agriculture and Mechanic Arts and the establishment of proper courses in it, the less easy seems the solution. It is going to be difficult for instance to plan a course for a college which has no site or buildings or students in a country where there are no farms. It is not going to be possible to follow entirely, or much, the lines laid down by the experience of other colleges; it is not going to be wise to do so.

As I understand it, the desire of the Regents of the college in Hawaii is so to plan the course that it shall entitle them to a portion of the Federal appropriation. That means a college to which perhaps no exact definition has been given, but yet clearly above the grade of a high school or academy.

The law says that the function of the college is "to promote the liberal and practical education of the industrial classes; its leading object to teach such branches of learning as are related to agriculture and the mechanic arts * * * without excluding other scientific and classical studies." Each is under obligation to provide "instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, economic science with special reference to their applications to the industries of life." In addition to agriculture and the mechanic arts, the law says specifically that military tactics shall be taught. I am afraid

that there may possibly be some misconception in some quarters as to what this means for I know of no place in the world where the word college as applied to institutions of learning is more of a misnomer than here in Hawaii. The new college should be a college in fact as well as in name. It should ultimately require the completion of a four years' high school course of study as a requisite for admission to its Freshman Class, and then seek to maintain strong four-year courses in agriculture and in the applied sciences. For economy's sake, at least, there should be no duplication of the work done at the people's expense at Lahainaluna or of the courses at Kamehameha or at any of the other schools.

A great many similar colleges in the sparsely settled sections of the West have courses which are hardly better than high school courses, but their excuse is that there are no good high schools from which to draw students. Other colleges have sub-freshman or preparatory departments to meet this difficulty. But with at least two schools of high school grade in Honolulu and others on the way outside, the College of Agriculture and Mechanic Arts, providing it has attractive courses, ought to draw some students who are prepared for their work. I believe, too, that for some time at least the student body will not be so large as to crowd even modest buildings. I trust that numbers will not ever be an inducement for lowering the educational standards.

It has been a noticeable feature of similar colleges in the East that they tend more towards the mechanical and engineering side than towards the development of agriculture. The standards for this work are well established by our Eastern scientific and technical schools. The college can afford only to offer courses that will give the best training. That will probably mean a limited field within which the training shall be adequate and thorough. It is well that the mechanical industries are so closely connected with agriculture. Courses can be planned and carried out that will prepare young men for our main industry, as well as for other mechanical pursuits in the Territory. This means not merely the training of men for a trade, but also the making of skilful, thinking engineers and mechanics.

The main purpose of this college—especially on its agricultural side—is to raise up leaders. This Territory practically has no farms. Before it has farms and profitable products, the principles of agriculture that can be successfully applied to our peculiar local conditions must be studied and applied not solely by the professors in the college and investigators in the experiment stations, but also by farmers in the field who have been trained in the science and who can tell after an experiment why they have succeeded or failed. On the basis of scientific experimentation by the college professors and by

the various scientists in the experiment stations, and with a knowledge of the principles and practice of agriculture and a trained mind for grasping new problems, these students should go out into the fields of Hawaii and demonstrate by actual production and sale of crops, not once or twice but all the time as a means of livelihood, that agriculture is to be an economic factor in the Territory's development.

If the college is going to raise up leaders, it has got to have the material out of which to fashion them and the tools and equipment by which the moulding process may be done. The college can not open its doors to every boy on the street who can neither understand what he is told nor comprehend what he reads in the simplest text book. The students must have training; they must be able to understand and comprehend the instruction; they must be able to apply the principles that they learn to practical problems. It needs no provisions in the Federal statutes, which say that you must have a college with such and such courses or you can not have Uncle Sam's money, to prove that the best interests of the people of the Territory demand that high entrance requirements be imposed and such a course of study planned as will guarantee that students of ability be in the courses—students who will make thoughtful, studious, progressive men. Some one has said that an agricultural college is not to teach boys to hoe, but when and in what soil to hoe.

In discussing educational standards here tonight, happily it is not my duty to outline entrance requirements or to plan the college course. That pleasant task falls on the Regents. That there is great divergence in what shall constitute a proper course is shown by these statistics which I read some little time ago, showing per cent. of courses given in two colleges in the three main groups of studies:

College	Culture	Non. Tech. Scien.	Technical
A	40.9%	24.6%	25.4%
B	8.1	39.3	52.6

In spite of this great diversity of courses, each is a prominent college in States not dissimilar in interests and development. All the other colleges ranged between these two extremes.

At about the same time the Association of American Agricultural Colleges and Experiment Stations adopted the following list as a minimum requirement in general studies:

Mathematics: Algebra, geometry and trigonometry: three years.

Physics and Chemistry: two years.

English Literature and Language: two years.

Other languages: four years.

Mental Science or Logic or Moral Science: one year.

Constitutional Law: one year.

Social, Political or Economic Science: one year.

This does not seem like an exorbitant requirement. This would constitute about two-fifths of the work, the other three-fifths being technical scientific subjects.

And as a minimum for entrance requirements, they united on

1. Physical geography;
2. U. S. history;
3. Arithmetic;
4. Algebra to Quadratics;
5. English grammar, composition and literature.

Except in English literature, our Punahou Freshman would have much more than this requirement.

Of course, the better colleges did much more than this. But this shows that the new college in Hawaii can and must start with a standard no lower than that, and if it is a good deal higher, it will more nearly meet the peculiar conditions here in the Territory.

This Territory needs first a body of agricultural science after which will come a genuinely scientific agriculture. Through the experiment stations—Federal, Territorial and private—a considerable agricultural science has been developed. The results of these years of actual study and experimentation should be available for the new college. They are, of course, generally to be had for the asking; but I believe that they should be brought into direct and specific use by having the scientific men of the station either personally connected with the staff of the college, giving a part of their time to the instruction in the college or in some less direct way affiliated with the new institution. The valuable knowledge of soils and products, of crops that may and may not be grown profitably, of proper methods of cultivation, and of all the details which these stations have been accumulating for years through experiment and trials should be quickly and thoroughly put to use in training the incoming generation of agriculturists. The investigator in the stations might very well be a teacher in the college. While the work in each should be distinct, the two can well coöperate.

The college must have such a judicious combination of the so-called literary subjects with the scientific and technical subjects and must give such a good, genuine broad education in these subjects as will make not men who have received just enough knowledge to become dangerous, but men who will make the industrial pursuits worthy callings for educated men and who will bring blessings to this community by increasing its resources and profitable products.

WHAT THE COLLEGE CAN DO FOR HAWAII.

By Walter G. Smith, Editor Pacific Commercial Advertiser, Regent of the College of Agriculture.

It is a very general feeling that the new College of Agriculture should do whatever, within its legal scope, will help Hawaii most. That duty seems to be to encourage, stimulate and bring about, the diversification of our farm industries. Sugar is quite able to look after itself. It has its own scientific laboratories, its own experimental farms, its large staff of trained men, its fine record of achievement. It does not seek or require the scientific aid of the college about to be founded. But tropical farming does need such aid. It asks the help of young men trained to find the right soil for the right crop, to protect that crop from pests, to improve the quality of the product and the magnitude of the yield. If Hawaii can train enough young men to this service then it may regard its future with satisfaction. Idle acres will eventually be turned into good farms. All our industrial eggs will not be carried in one basket. Prosperity, now the privilege of the few, will become the happiness of the many. The Territory will be in shape to get the substantial middle class it needs to "develop along typical American lines." It is a fair question: Could the new college have a more useful mission than this? Is there any worthier work for it to do?

The dream of a Hawaii of farms and homes is not an illusive one. There is nothing in frost and ice and rugged soil and angry skies to guarantee a success in agriculture which is denied to sunshine and rain, fertile volcanic earth and temperate breezes. People who go into farming for staples and make money in competition with millions of others have no reason to fear the results when they go into farming for luxuries, which everybody wants and but few produce. Instead of being a place to avoid in agriculture, Hawaii is a place to seek. Sugar uses but 200,000 acres out of a total area, good and bad land, of 4,250,000 acres; and there is room for a multitude of people to grow other things than sugar. To help them do it would appear to be the best and highest object of the College of Agriculture.

THE RELATION OF SECONDARY EDUCATION TO THE AGRICULTURAL COLLEGE.

By Perley L. Horne, Principal Kamehameha Schools.

Secondary schools usually include schools below the college and above the intermediate and low grammar. In Honolulu, secondary schools would naturally include Oahu College, the

High School, the Normal and the upper classes of Kamehameha. The last named school, while below the grade of the others in strictly college preparatory work, is equal to them and perhaps ahead in scientific and mechanical work. In mechanical and freehand drawing, in nature study, in domestic science, in the scientific study of chemistry and physics in relation to daily life, in scientific agriculture, and in shop work of all kinds, Kamehameha will easily bear the test. In purely academic work, she must be content to rank below the others.

But for the purposes of this paper, I think that I may rightly include Kamehameha in the list of schools whose students will rightly claim the advantage of the new agricultural college.

The presence of such a college in our midst will necessarily bring changes in the course of study in all these schools, to prepare young men and young women better to take up the advanced work of the college. The new college is to be something more than a farm: and its students are to be something more than tillers of the soil. The secondary schools are to be the natural feeders of this college. To do this well, new courses of study will need to be developed in the secondary schools along scientific and agricultural lines. More nature study work, preliminary courses in agriculture, domestic science, manual training and allied subjects must be more fully developed.

To do the best work, the college must receive into its regular courses students who have some elementary knowledge of these subjects. Preparation of this nature will be as valuable as work in classics, advanced mathematics or modern languages, admirable as these latter are.

The elementary work the college ought not to be expected to do. However, this paper does not have to deal so much with what the college is to be or do as with what the secondary school should be to help best the college. This I believe the college will help determine.

I believe fully in industrial education in the secondary schools; the training of the hand as well as the head and heart. By industrial training, I do not mean alone shop work, but scientific study of every kind, also agriculture in its various departments, and practical and social and civic problems. Each secondary school should have its beginning courses in gardening, horticulture, forestry, agriculture, as well as in arithmetic and history, not only to interest the young in these vital phases of life, but to arouse their love of all that pertains to the plant and animal life of our universe. A school of advanced study in such subjects would of a right expect elementary work along such lines in the schools that naturally supplied students to it.

Special requirements for admission must be met. To read, to write and to cipher, will not be enough. The college will have a right to expect its young men and young women to have a fair training in the common English branches, and to have some knowledge of plant life, of insect life, helpful and harmful, of the elements of the soil, of gardening, a fair knowledge of the fruits and trees of their home land. This knowledge to be universal in the Territory cannot be left for the home to impart, but must be given by the schools. These questions are of as great educational value as any subject studied and of far greater practical value than many subjects taught. The presence of the college will be a great stimulus to all scientific study in our secondary schools. So soon as the general requirements for admission are laid down by the Regents and the new faculty, at once the duty of all the secondary schools will be to furnish courses of study to meet these requirements so that the young people of our Territory may speedily avail themselves of the fine opportunity the new college will offer.

And yet the doors of the college ought not to be closed to those whose privileges have been restricted and who are mature students, to avail themselves of certain lines of research in special work made possible by the college. Here the college can offer a splendid opportunity for special students. Young men and young women who wish to pursue some special line of research, but whose academic preparation does not fill the general educational requirements for admission should have the privilege of entering to study their special field. For instance, a young man may wish to study chemistry, to prepare himself to be a chemist upon a plantation, or in the fertilizing works. Given a fair general education, a mind capable of grasping the subject wished, and a purpose to do the work he wishes, the student should receive every encouragement that he may get the start he seeks. Or if some one wished to study dairying or poultry-raising, veterinary, or bacteriology, the chance should be given if certain conditions are met.

But I wish especially to emphasize one phase of the general question. The new college cannot afford to set its requirements too low. Better to begin with five pupils well prepared, and keep the standard high than to begin with twenty-five at a low entrance standard. I think it behooves the Board of Regents to give a very clear statement of the requirements for admission as regular students and the minimum requirement for special work, and the college will do well to emphasize the regular course and to discourage special course, although there will always be a demand for the latter which should be met. The ideal can not be too high. To start with a high standard is easier than to raise that standard. And

yet the full requirements need not be met the first year, although no diploma should be granted unless the full standard is maintained in all the branches of work required for graduation.

Let me present a tentative program for admission as a basis for argument, and in this rating my plan has been to follow somewhat those adopted by the better class of colleges on the mainland, differing in details to meet local conditions.

I recommend that thirty-five points be required for admission as a regular student. That the following subjects rated as indicated, twenty-seven points be required of all regular students and that subjects aggregating eight points be required elected from other subjects:

SUBJECTS REQUIRED FOR ADMISSION.

	Points
English	6
History of Hawaii	1
History of the United States	2
Arithmetic including the metric system	2
Algebra through quadratics	3
Plane geometry	3
Island nature study (a three years' course)	4
Elementary physics	3
Elementary chemistry	3

ELECTIVE SUBJECTS FROM WHICH 8 POINTS ARE TO BE CHOSEN.

	Years	Points
Latin	3	4
Elementary French	2	2
Elementary German	2	2
Advanced German	1	2
Advanced French	1	2
Advanced Algebra	1	1
Solid Geometry	1	1
Trigonometry	1	1
Advanced Physics	1	1
Advanced Chemistry	1	1
English History		2
Oriental History		2
General History		2
Freehand Drawing		2
Mechanical Drawing		2
Architectural Drawing		2
Projections		2
General Knowledge of Hawaiian, Japanese, Chinese, Portuguese and Spanish, each . . .		2

	Years	Points
Special knowledge of same, each.....	..	2
Bookkeeping	2
Stenography	2
Commercial Law and Business Forms.....	..	2
Carpentry	2
Wood-working	2
Machine tool work	2
Blacksmithing	2
Chipping, filing, fitting	2
Electricity	2
Harmony	2
Counterpoint	2
Civil Government	2
Economics	2
Physiography	1
Botany	1
Zoology	1
Astronomy	1
Anatomy, Physiology, Hygiene	2
Meteorology	2

This wide range of subjects would allow great freedom in preparation.

I recommend that the 35 points indicated be required of the entering classes in 1907-1908, 1909; that in 1910, the required number be 37 points, i. e. 10 electives; in 1911, 39 points, and in 1912 and thereafter 41 points or 14 points for the elective list.

I recommend that the requirements in each subject designated be explicitly stated by the faculty of the college, so that each preparatory or secondary school may know exactly what will be required in each subject.

I recommend that no student be allowed to enter as a regular who shall fail in ten points, that no student be allowed to graduate from such college until he shall have completed the regular prescribed course of the college and have passed off all entrance conditions or completed an amount of extra work in the college to offset conditions.

I recommend that specially approved candidates who pass 15 points be allowed to enter the college as special students to pursue such course or courses of study as the faculty may approve. The terms of their certificates from the college would naturally be determined by that body.

I recommend that graduates of Oahu College, the Honolulu High School and the Hilo High School be entered on certificate, credit being given only for the points definitely stated by the president or principal of these institutions; that graduates of Kamehameha and Lahainaluna be given credit in

such subjects as the president or principal may recommend, and in no other subjects: that all other candidates be required to pass the entrance examinations.

I recommend that credit be given any candidate presenting certificate from the College Entrance Examination Board in those subjects in which he or she has been examined and passed and in no other.

I recommend that the certificate privilege be taken away at any time from any institutions whose pupils may continue to prove incapable of carrying on the work of the college.

I have presented at some length this tentative schedule. It embraces many subjects, but no more than are presented by our best institutions on the mainland. Some of these subjects may be omitted: others may be added. Different rating of many of the subjects might be made. I present the list with the ratings as a basis for further consideration.

Given a schedule like the one outlined or any other as explicit, the various schools of the Territory would know what to do and would at once fashion their courses of study to meet the requirements. Perhaps the requirement for admission as outlined may seem too hard. But with provisions made for special students I do not believe them excessive, and I do believe that the new college will more quickly get results by setting at the start a high standard and increasing this as time goes on until it will be second to none.

The secondary schools will meet the standard set by the college. If that standard is low, the standard of our public schools will decline, for I hold it almost an axiom, that the highest public institution in any State or Territory will shape the standard of all the secondary schools to meet its requirements. We have the right to demand of this new institution that it rank with the best. The number of students at the start may be small, but that matters not. The ultimate good of the whole Territory should determine the policy. And to my mind the standard of admission needs to be high, that results may be obtained. A slipshod beginning with low entrance requirements and a snap course, accommodating all who wish to enter, will make the college unworthy the name and will turn out young men and young women with a thin veneer of information that will not bear the test of the hard-headed, horse sense business world of today.

If the list of subjects presented seem altogether too long and too varied, particularly the elective course, consider this: The mere mention of these courses on the list of requirements would indicate to the secondary schools the immense range of subjects that can be taught in our secondary schools. No school could begin to teach all. All schools could teach some and probably more than they now do. The day is past that the school schedule follows absolute and fixed lines. Local

conditions determine and rightly many of the elective courses in schools. A study of the Japanese beetle in the public schools of Hawaii would be a help to the Territory, in Massachusetts, the time spent would be ill-advised. In Massachusetts many of the public schools study the gypsy moth and the potato bug. The study of these insects in Hawaii would not bring results. The same is true of rice culture in New England, no benefit would come, proportioned to the time. In Hawaii the reverse is true.

A schedule of possible subjects to be offered for admission to the Agricultural College, and these subjects well-defined, would act as an inspiration to the public school and would induce a course of reading in the home that would rarely be considered without the impetus of a schedule of possible requirements.

With this final suggestion, I am through. The secondary schools of the Territory have a right to demand that their standard be raised by every possible means. A low grade college will lower the standard. A high grade college will raise the standard and increase the efficiency of our secondary schools, and as the capstone, such a college will grow into a Territorial University, whose graduates will revolutionize the agricultural and industrial life of Hawaii nei.

WHAT SHOULD THE COLLEGE OF AGRICULTURE MEAN TO THE AGRICULTURIST?

By Mr. Byron O. Clark.

The modern agricultural college is the outgrowth of a condition brought about by the wasteful, ignorant methods of soil tillers of generations past.

The day when a worn out farm could be abandoned, and one of virgin fertility obtained farther West for the asking, soon passed; and the agriculturists found themselves face to face with a problem; the worn out soil must be rejuvenated, or they must change their occupation.

True to the American instinct when aroused by necessity, they set about investigating and experimenting; the deeper they went into the subject the more important it grew; and it was necessary to appeal to science through men who, although not practical soil tillers, could give from the scientific standpoint of the chemist, some knowledge of the relations of the various soil elements to each other; how each had its affinity for some other element which, on becoming exhausted from the soil, not only left it deficient in that element, but also made its affinitive element unavailable as plant food.

Often on suggesting the addition of one simple element to the soil, it would grow certain crops to the perfection of olden times. At other times, with other crops, the results were not so satisfactory, and it was in time found that the wisdom of the chemist could not always unlock nature's secrets; this led to coöperative experiments between the tiller of the soil, and the man in the laboratory. Thus from a small beginning arose the necessity for specialized scientific investigation; a fact quickly recognized by some of our colleges, and to a limited extent by the farmers.

The demand for this broader education by our farmers, met with munificent provisions for agricultural colleges by the Federal Government and has grown to such an extent that most of our States and Territories now have well equipped colleges; but I am sorry to say that in some instances, sufficient prominence has not been given to the agricultural features in the truest sense, and in other instances, the farmers have been slow to recognize the importance of the training to be obtained at these institutions by their children.

The founding of such an institution as the proposed Agricultural College of Hawaii, should be one of the most marked forward movements in the development of diversified agriculture in these Islands, that has ever been taken. On account of our unique location, I predict that it will become, within the life time of most of its first Board of Regents, one of the important agricultural institutions of the United States; when students from the mainland and from foreign countries will be interested, seeking to enter its portals.

There never has been a time when tropical agriculture attracted so much attention as at present. We have here a virgin field for investigation, with ideal climatic and other conditions for founding an institution for the study of all that pertains to tropical agriculture. There is no place in the world so well suited for the work which we should take up, as Honolulu.

It should be the aim of this institution to equip our young men and women with a practical, scientific education that will enable them to go upon our hill sides and plains and make them produce to the highest perfection, the various tropical fruits and other products for which these Islands will surely become noted; they should not only be taught the theory of agriculture in all its branches, but they must learn the practical application of the knowledge gained for the benefit of their vocation.

Above all they should be taught the honor, glory and dignity of being able to win a competency from the soil, under adverse, as well as favorable conditions; they should be able to look back in their mature years and say, "I owe whatever success I have attained in my calling to the instruction and

experience received at my Alma Mater—the College of Agriculture of Hawaii.”

This institution should be of greater significance to agriculture than to any other industry of Hawaii; it should *mean* more to the soil tiller than any institution to be established here. We are distinctively an agricultural community; excepting sugar we have no well established agriculture in any of its branches; the possibilities are not dreamed of by the most enthusiastic advocates of diversified industries.

This college means that our young people will be taught how to unlock unknown riches now lying dormant in our virgin soil, making it productive, and greatly adding to the wealth of the country; at the same time beautifying hillside and valley with fruiting tree and vine, blooming plants and waving pastures of succulent forage, such as is not deemed possible today, because of our lack of knowledge, and the faith which only comes through knowledge.

The higher education along specialized lines, made possible by this institution, will bring about this transformation. All this, and more is what the College of Agriculture will mean to Hawaii.

HOME MAKING AND THE ART OF RIGHT LIVING AS INFLUENCED BY THE COLLEGE OF AGRICULTURE.

*By Miss Minnie Reed, Science Teacher Kamehameha Manual
School.*

Among the earliest of land grant colleges to be established were the Michigan and Kansas Agricultural Colleges. For twenty-five or thirty years they have led all others in the quality of their work and in their influence upon the citizens of their State.

They have not been fused with their State universities, so have kept their individuality and done their own special work well. They have laid their foundations on broad, generous lines, and have developed fine, strong men and women from the young boys and girls sent to their halls. Sometimes these boys and girls come from very crude homes and from untrained or illiterate parents, but not always; for many students come from cultured homes, either from ranch, farm, village or city. Most of these boys and girls are young, from fourteen to eighteen, and usually they are very much in earnest and anxious to gain the practical training offered.

I know most about the Kansas Agricultural College, so shall tell something about the work it has done and is doing for the homes of the commonwealth. Other agricultural colleges are doing similar work in other States, but no State has as

well-equipped, well-organized domestic science department as Kansas.

President George T. Fairchild, brother of the famous Oberlin president, wisely directed the affairs of the Kansas Agricultural College for nearly twenty years and laid the foundation on broad, practical lines. He was one of the earliest advocates of the laboratory, manual or technical training, along with the scientific and English work, in agricultural colleges. After much opposition and against many obstacles, he demonstrated the advantages of such training for the students under his care. He always said, "We learn best by doing; so we must have adequate laboratories for the sciences and shops for the manual and technical training." He often said, "Our students are young enough to graduate here; then go to the university for the higher training; for we train the head and hand together." He believed this so thoroughly that he sent his three sons to the agricultural college for their preliminary training, before he sent them on to an Eastern college to take professional studies.

Very early in the history of this college, domestic science was put into the curriculum for the girls, on the same basis as the practical agriculture for the boys; and no boy could graduate without the agriculture, and no girl without the domestic science.

The boys have five hours per week of actual practical farm work in fields, gardens, orchards and in caring for the farm animals; besides class-room lessons and lectures upon agriculture, soils, etc. The girls beginning with the first year have five hours weekly devoted to plain sewing, dressmaking, embroidering, etc., besides lectures on economic and hygienic clothing for women and children. The second year is devoted to cooking all kinds of foods from the plain bread and beef-steak to pies, cakes, puff-paste and French candies. Serving a meal daintily and artistically is also a part of the actual laboratory training; for there is not only a kitchen and range, but a china closet and a dining room, where breakfasts, lunches and dinners are actually served by the girls, who have to act as hostess when the governor and regents, faculty or less august friends visit the college.

Besides this, the girls are taught how to cook for invalids and children, and study the proper balanced ration for the brain worker, day laborer or athlete; and the chemistry of all the staple foods and their relative digestibility.

Fruit canning, the making of jellies, jams, preserves and pickles is put in the last year, along with marketing, for those girls who take domestic science for their major subject.

It is needless to say that many a girl specializes in domestic science, especially if during the four years' study she has considered the proffered partnership of some young farmer and

expects to preside over their home. The young men and women meet freely in class-room and social affairs of the college, and many life-long attachments are formed before graduation. There are also special courses in horticulture and home flower gardening offered to any girl who chooses them, and very many choose to spend two hours per week during their senior year in learning how to raise various kinds of house or garden plants. Under the direction of a genial old Scotch gardener these two hours are a delightful recreation, whether it be in the conservatory or out in the spring sunshine planting seeds or pansies and roses. Every girl also has special lectures in personal hygiene, in the care of a family, in household sanitation, decoration and furnishing; besides, vocal and instrumental music, drawing, designing, etc., are offered to any who choose.

Perhaps you wonder how they find time during these four years for any academic work. All who wish to go to the university must prepare their Latin under a tutor outside of college. The general scientific course requires enough mathematics, science, German and English for entrance into the scientific course of the university; besides the domestic science and agriculture, economics, psychology, etc.

The special courses, as the domestic science course, the agricultural, mechanical and electrical engineering, or other courses, do not give so broad a training, as the specialization begins earlier.

The college also offers short summer courses for teachers and winter courses for farmers or those who can not hope to graduate. These courses include domestic science, drawing, physical culture, floriculture, dressmaking, bacteriology, dairying, crop production, botany, horticulture and various agricultural subjects.

Farmers' institutes are conducted throughout the State by the professors from the college. These are supported in every community by the progressive farmers and their wives, many of the leaders having been trained at the college.

Many of the Kansas farmers are from the best class of New England, so are an intelligent and thrifty class of people. These, of course, receive the most benefit from these institutes and from contact with the men and women who are trained in college.

However, the illiterate foreigners who have settled on the farms are gaining much good from the lectures and demonstrations given at these institutes and from the farmers who have been trained in college. These college-trained farmers and their wives are a great leaven in every community and are leading their foreign neighbors to send their children to college and to improve their homes and raise their standard of living.

What are the results of this training upon the homes and the agricultural interests of the State of Kansas?

First—It has made more efficient and prosperous farmers, hence has increased the value of land and of crops many times over.

Second—It has developed a love for country life not known to uneducated farmers.

Third—It has added to the beauty and comfort of farmers' homes, as many of the farmers' wives have the training that makes them helpful comrades for their husbands and children, as well as good housekeepers.

Fourth—It has improved the community life, for the love for books, music and art gained at college has interested them in libraries and lectures, and in better music and pictures, while enough of the social graces have been acquired to enable them to meet people easily and freely.

Fifth—It has interested them in civic affairs, for all have had some training in sociology and political economy. The farmers of Kansas are alive to social questions and political interests of their State and the Nation. Nothing could illustrate this better than the recent fight with the Standard Oil monopoly. It was the intelligent interest of the farmers of Kansas that made that fight possible and successful.

Sixth—It has greatly improved the rural schools, both in raising the standard for the teachers, in better buildings, more attractive school grounds, and better equipment and furnishings for the schoolhouse.

Seventh—It has resulted in happier homes, in healthier families, stronger, better-nourished and better-trained children; because the farmers' wives have more to make their lives interesting and are better poised and are more intelligent. And yet this is not all, for the Kansas College of Agriculture, for one, has further made good, it may be stated, in that fifty important positions in our National Department of Agriculture are held by its graduates, and as many more are teachers of agriculture in State colleges, and many more are numbered among the State's honored citizens—professional men and women, merchants, and advanced practical agriculturists.

A UNIQUE OPPORTUNITY FOR THE COLLEGE OF AGRICULTURE OF HAWAII.

By J. E. Higgins, Horticulturist Hawaii Experiment Station.

The natural function of an agricultural college is not primarily research, but instruction. It does not discover, but *teaches* truth. It should take the results of the work of investi-

gators and place it in the possession of the people. This it does chiefly through the young as in all branches of education, but those of the middle aged and the old, who are yet young in spirit should profit much by its teaching.

Until a very few years ago practically all the work of research in agriculture had been done in the temperate zone. It is true that there had been botanic gardens in tropical countries, where collections of tropical plants had been cultivated, but experiment stations or other institutions for the study of the laws of agriculture in the tropics or of the application of known laws to tropical conditions are of the most recent advent. Naturally enough, however, these stations have preceded the institutions for higher agricultural education. The unique opportunity has presented itself to the people of Hawaii to establish the college of tropical agriculture of America. There is today no college on American soil so located and equipped as to supply the needs of the American student seeking instruction of a high grade in tropical agriculture. The need of such an institution is apparent in view of the tropical areas which have recently been added to the domain of the United States. The Philippines, Hawaii and Porto Rico will call for a large force of young men trained in tropical agriculture. A few years ago there were those who prophesied that there would be an over-production of graduates from the colleges of agriculture on the mainland. As the number has grown the demand has increased, and there are today more openings for the hundreds than there were a few years ago for the tens. These young men are demanded not only by institutions for research and instruction, but by private employers in many capacities. The man of wealth with large country estates seeks a manager at the agricultural college or among its men already in the field. Further, the young man of today who intends engaging in agriculture as a private business, if he is alive to his opportunities, avails himself of the advantages afforded by one of the agricultural colleges.

As progress is made in the development of the agricultural resources of Hawaii and other American tropical territory there will be an increasing demand for young men trained in tropical agriculture. I know of a young man who recently received an offer as a plant breeder in the tropics. The offer came from a business corporation, and the remuneration would have been in the neighborhood of \$5,000 per year at the start. This single field of plant breeding will occupy the attention of large numbers of young men in the future, and no field is more promising or will be more prolific in results than the tropics. Little has been done to improve tropical plants and with the exception of a few species, there has been practically no plant breeding. The work of Burbank, which has justly attracted so much attention will be repeated in

many spheres of plant life. Mr. Burbank is a pioneer. By his careful study of plants and the laws which govern the plant breeder and by his never-failing patience, he has accomplished results which seem astounding, but the future will present far more astonishing achievements. Where can the young man who wishes to enter this or other fields of tropical agriculture find a college training adapted to his needs? The College of Agriculture of Hawaii should be prepared to fully equip him for his work. While we cannot overlook the work of preparing young men for agriculture as a business, the College of Agriculture will, in my opinion, fall short of its high opportunity if it fails to give a strong and liberal education to its advanced students, so that they will be prepared to occupy positions of importance and large usefulness in this or other lands. This teaching of the science of agriculture need not in any way interfere with the instruction in the art of agriculture.

There may be those who cannot see where our student body is to be derived from for this high class of work. The college will create a demand for agricultural education and for educated agriculturists. As the students of Oahu College, the High School, Kamehameha, and the other preparatory schools of the Islands become aware of the opportunities for students in agriculture, and of the fact that to acquire an agricultural education at the college, requires little in money but much in perseverance and work there will be many of the ablest among them who will seek its open doors. There are young men today in our agricultural colleges of the mainland who are looking towards the tropics as the field for their future work. They are endeavoring to study tropical agriculture with frozen soil and snow-covered fields. To get such young men in the College of Hawaii would result in bringing to this country many an enterprising young man, who would remain and who by his financial and mental resources, would do much for the development of the Territory. Many another who here gained his knowledge of tropical agriculture would in distant lands do valuable promotion work for the agriculture of Hawaii, and would doubtless send us many a settler. Since it is confidently expected, a very large part of the financial support of the college will be from the United States treasury, it is only fitting that the institution should have something of a national character.

It will be felt by some that this is too high and too large a work for a college of resources so limited as those of the College of Agriculture of Hawaii. I believe, however, that small means need not prevent this work being carried out. There is in Hawaii today a body of specialists in many branches of tropical agriculture and who are, I believe, sufficiently interested in the development of Hawaii and its agricultural re-

sources to give a limited portion of their time to lecturing in the college, uninfluenced by financial considerations. A large part of the staff could be supplied by the same method as is now in vogue in many of the strongest medical colleges wherein physicians devote a certain portion of their time to college lectures. Frequently the services of the ablest medical men could only be secured in this way. If a course of advanced lectures in forestry, rubber cultivation, soils and soil management, tropical entomology, plant pathology, and the like could be given by the specialists in these lines who are already in the Territory, the College of Agriculture of Hawaii could offer to its students a course so strong as to compare favorably with any of the colleges of the mainland in its special sphere. An occasional lecture could also be provided by some one who has made a success in the business of agriculture from a commercial standpoint. This practice is being carried out by colleges on the mainland, and has its valuable features. It draws the farmer into closer contact with the college, and the college into closer sympathy with the work of the farmer. The students gain much inspiration as well as valuable information from a talk by one who has succeeded in the growing of pineapples or some other crop.

In this way it would be possible to build up on small resources a very able college of tropical agriculture, unique in its sphere among American agricultural colleges, equal in its standard to any of them, and which would be a powerful force in the molding of the future of agricultural industries in Hawaii.

SYLLABUS OF A FOUR YEARS' COURSE IN AGRICULTURE BASED UPON THE SEVERAL REPORTS OF THE COMMITTEE ON METHODS OF TEACHING AGRICULTURE OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.¹

(Compiled by F. G. Krauss.²)

General subjects essential to a four years' course in agriculture leading to the degree of Bachelor of Science:

	Hours.
Algebra	75
Geometry	40

¹ Committee of the Association of American Agricultural Colleges and Experiment Stations. See Reports U. S. Dept. of Agri., Office of Experiment Stations, Buls. 41, p. 57; 49, p. 29; 65, p. 79; 76, p. 39, and Bul. No. 127; and Circ's. 32, 37, 39, 41, and 45.

² With slight alterations to adapt same to Hawaiian crops.

Trigonometry	40
Physics (class-room work).....	75
Physics (laboratory work).....	75
Chemistry (class-room work).....	75
Chemistry (laboratory work).....	75
English	200
Modern languages	340
Psychology	60
Ethics or logic.....	40
Political economy	60
General history	80
Constitutional law	50
Total	1285

The total number of hours included in a four-years' course, allowing fifteen hours per week for thirty-six weeks, would be 2,140; with ten hours' laboratory work, or practicums, added, 3,600. In general terms, therefore, the foregoing general studies should comprise about two-fifths of the work required for a bachelor's degree in agriculture.

The committee on methods of teaching agriculture suggests additional subjects to be included in a four-years' course in agriculture leading to the degree of bachelor of science, as follows:

	Hours.
Agriculture	486
Horticulture and forestry.....	180
Veterinary science, including anatomy.....	180
Agricultural chemistry, in addition to general require- ment	180
Botany (including vegetable physiology and pathology)	180
Zoology (including entomology).....	120
Physiology	180
Geology	120
Meteorology	60
Drawing	60
Total	1746

In reckoning the number of hours, two hours of laboratory work, or practicums, are considered the equivalent of one hour of recitation. In this way the total number of hours in a four-years' course is made 2,900, instead of 3,600.

Taking up the subject of "Agriculture" designated above, the committee recommends that agriculture (486 hours) shall include and be divided into:

	Hours.
1. Agronomy, or plant production.....	132
2. Zootechny, or animal industry.....	162
3. Agrotechny, or agricultural technology.....	72
4. Rural engineering, or farm mechanics.....	60
5. Rural economics, or farm management.....	60
	<hr/> 486

SYNOPSIS OF COURSE IN AGRICULTURE.

Agronomy, 132 hours.—Climate, soils, tillage, drainage and irrigation; fertilizers, plant production, farm crops.

Zootechny, 162 hours.—Principles of breeding, breeds of live stock, stock, feeding, care and management. (Animal physiology to be taught under physiology; anatomy and animal diseases, under veterinary science.)

Agrotechny, 72 hours.—Butter making, cheese making. (Other topics, such as sugar making, wine, or olive oil making, may be taught under this head in different parts of the United States.)

Rural Engineering, 60 hours.—Roads, drains, irrigation systems, farm buildings, and machinery.

Rural Economics, 60 hours.—History of agriculture, farm management, rural law, farm accounts.

EQUIPMENT FOR COURSE IN AGRICULTURE.

The following brief statements may serve to show in a general way the equipment required in connection with the instruction given in a four-years' course in agriculture:

Agronomy.

Field trials of various crops for class demonstration.

Laboratory (including glass house) for work in soil physics, not experiments, etc. This laboratory should have a floor space of from 1,000 to 2,000 square feet.

Collection of soils, fertilizers, plants, etc., for class illustration.

Photographs, lantern slides, charts, diagrams.

Books of reference.

Zootechny.

Live stock of different types and breeds.

Lecture room, arranged for exhibiting live animals to class and equipped with instruments of precision for weighing and measuring.

Collections: models, mounted specimens of animals, specimens of foods, etc.

Lantern slides, photographs, charts, etc.

Reference books, especially herdbooks and stock registers.
(There should be a seminary room for the use of these books.)

Agrotechny.

Dairy laboratory (this should include the following rooms, which may cover some 6,000 feet of floor space): Butter-making room, cheese-making room, cheese-curing room, pasteurizing room, receiving room, store room, refrigerating room, boiler and engine room. These rooms should be equipped with all modern apparatus for testing and pasteurizing milk and making butter and cheese.

Rural Engineering.

College farm should illustrate various problems in farm engineering, such as roads, drainage, and irrigation.

Laboratory, equipped with apparatus for illustrating various mechanical problems in farm machinery.

Collections: tools and farm machinery.

Lantern slides, charts, and diagrams.

Reference books.

Rural Economics.

Reference books.

BOARD OF AGRICULTURE AND FORESTRY.

REORGANIZATION OF COMMITTEES.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on April 17th, Mr. W. M. Giffard, the President of the Board made announcement that certain of the Committees of the Board had been reorganized, on account of the resignation of former members of the Board and the appointment of new men. The list of Committees as they now stand is as follows:

Forestry—Messrs. A. W. Carter, W. M. Giffard and P. R. Isenberg.

Entomology—Messrs. W. M. Giffard and G. P. Wilder.

Finance—Messrs. C. S. Holloway and W. M. Giffard.

Rules and Regulations—Messrs. A. W. Carter and C. S. Holloway.

Agriculture—Messrs. G. P. Wilder, L. G. Kellogg and P. R. Isenberg.

Animal Industry—Messrs. A. W. Carter, P. R. Isenberg and L. G. Kellogg.

PRESIDENT PRO TEMPORE.

To insure that the Board of Agriculture and Forestry shall never be left without an Executive Officer, the Governor has ruled that on leaving the Territory the person holding the office must resign. Accordingly, during the absence of Mr. W. M. Giffard on a three months' trip to the mainland, Mr. C. S. Holloway has been appointed as President and Executive Officer. Mr. Holloway's appointment took effect on the day of Mr. Giffard's departure, May 22, 1907.

DIVISION OF FORESTRY.

ROUTINE REPORTS.

April 17, 1907.

Board of Commissioners of Agriculture & Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report, covering the routine work of the Division of Forestry, from April 3rd to date.

During the fortnight, I have been continuously in Honolulu engaged with the routine work of the Division and with the preparation of two reports on forest reserve projects. These will be submitted to the Committee on Forestry within a few days.

Since my last report Mr. Haughs has completed the planting plan for the Catholic Mission lands in Kalihi valley. A copy of the plan has been handed to Father Adelbert Rielander.

An application for a forest planting plan has been received from the Wahiawa Water Company. Mr. Haughs will visit Wahiawa this week to make the necessary examination on the ground.

Mr. Haughs has also made several trips up Nuuanu Valley to oversee certain work in transplanting trees and shrubs on the Atherton property made necessary by the construction of a new pipe from the Nuuanu dam.

I regret to report that House Bill No. 177, an Act introduced by Hon. Wm. J. Sheldon, to provide for the better protection of forest trees against trespass, was killed in the House.

A limited number of Farmers' Bulletins consisting of a series of about a dozen numbers has been received from the Delegate to Congress, and distributed to the principals of the larger public schools. There yet remains on hand some of

the congressional vegetable seed. This may be had upon application to the Mailing Clerk.

The library room of the Board was used for meetings during the past fortnight, as follows:

Hawaiian Entomological Society, April 4th.

Hawaiian Poultry Association, April 9th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 30, 1907.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit the following report covering the work of the Division of Forestry from April 17 to date.

During this fortnight I have been in Honolulu occupied with the completion of reports on a proposed forest reserve on the Island of Kauai and on the addition of certain government lands to the "area actually reserved" in the Koolau (Maui) and the Hana Forest Reserves. The remainder of the time has been taken up with attention to various details connected with the regular work of the Division.

On Thursday, April 18th, Mr. Haughs visited Wahiawa and completed the field work necessary for the preparation of a planting plan for the Wahiawa Water Company.

A collection of exotic seed has recently been sent out to thirteen volunteer observers who have consented to plant the seed and later set out the trees.

On Tuesday, April 23, Mr. Haughs moved into the cottage in the nursery grounds which has recently been put into repair. This will enable him to exercise continuous supervision over the grounds, a care which since Mr. Austin's resignation has not been exercised.

The library room of the Board was used for a meeting of the Honolulu Improvement Advisory Board on Tuesday, April 23.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Report of the Forest Nurseryman.

In a report to the Superintendent of Forestry dated April 30, Mr. David Haughs, the Forest Nurseryman, after mentioning his trip to Wahiawa, says:

"An order has been received from Mr. C. A. Brown, manager of the Ii Estate, for ten thousand trees to be planted on a tract of land examined by the writer on November 28th, 1906. The trees are to be ready by September and planted according to recommendations made at the time of examination.

Collection and Distribution of Seeds.

"The collecting of seed for sale and exchange purposes has been continued and a large variety of seed is now in stock.

"Packages of tree and other seeds are arriving by every mail, from those who have received seed from us.

"Exotic seed has been distributed locally as follows:

"W. D. McBryde Esq., Rev. Hans Isenberg, G. N. Wilcox, Kauai.

"L. von Tempsky, Esq., H. A. Baldwin, Esq., Maui.

"James Munro, Esq., Molokai Ranch, Molokai.

"A. W. Carter, Esq., Parker Ranch, R. von L. Domkowicz, Esq., W. H. Shipman, Esq., D. Forbes, Esq., Robert Horner, Esq., Julian Monsarrat, Esq., Hawaii.

"John Herd, Esq., Oahu.

"Each of the above received one package each of the following:

- 1 pkt. *Pinus Ponderosa*,
- 1 pkt. *Pinus Canariensis*,
- 1 pkt. *Pinus Attenuata*,
- 1 pkt. *Pinus Coulteri*,
- 1 pkt. *Pinus Lambertiana*,
- 1 pkt. *Pinus Jeffreyi*,
- 1 pkt. *Sophora japonica*."

DIVISION OF ENTOMOLOGY.

REPORT ON HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, T. H., April 17th, 1907.

To the Honorable Board of

Commissioners of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen:—During the past two weeks we have visited fourteen steam and sailing vessels that have arrived in port from

outside the Territory, on which we found 5,643 packages of fruits and vegetables and 8 cases and bales of trees and plants. Half of the latter were intended for other Islands, but were inspected and treated here.

Four hundred crates of potatoes—the first that have arrived from Australia since my residence here—were found to be seri-



FIG. 10—Australian potatoes infested with caterpillars of potato moth (*Lila solanella*).

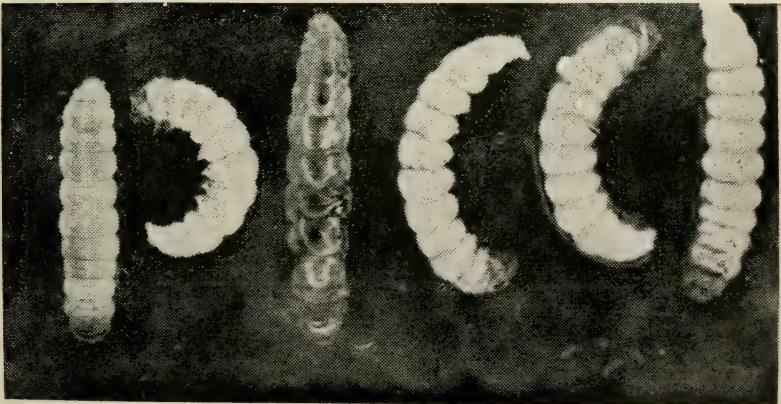


FIG. 11—Caterpillars of potato moth, enlarged about 5 times. Original.

ously infested with the caterpillars of the "potato moth" (*Lita solanella*). The crates with the potatoes were ordered back upon the steamer and the Captain was instructed to see that all were dropped overboard when the ship was one day from port. A sworn affidavit, attested to by the Captain, First Officer and Purser to be delivered to me by return. The potatoes were so seriously infected that not a single one could be found without one or more worms and some were so badly attacked that not an inch of sound tuber was left. The caterpillars appear to select or prefer the depression around the eye of the potato to spin their cocoons. Mr. Kotinsky has photographed a few of the caterpillars and their work; these photographs will give you a clearer idea of the destructiveness of the pest. We are not aware that this moth will attack the sweet potato or yams, but from its scientific name would conclude that it confines its attack to ordinary potatoes.

Garlic has heretofore been found free from insects, but on the same steamer from Australia as the infested potatoes arrived, six cases of garlic were landed here by mistake and my assistant, Mr. Jordan, found them attacked by a small brown beetle, so he ordered the cases to be immediately placed on board again and I advised the inspector—Mr. Ehrhorn—at San Francisco of their condition, for if the beetle becomes established in California it would be liable to reach us from there.

On the S. S. "Hilonian" that arrived from San Francisco on the 12th inst, amongst her freight we found seventy boxes of scale infested apples that we had reshipped to California on the S. S. "Sierra," sailing the same evening for San Francisco.

On the S. S. "Korea" Mr. R. H. Sawyer, representing the Department of Agriculture, Washington, D. C., returned from Japan where he had been sent by Secretary Wilson to secure the best variety of "rush" (*Juncus*) for the manufacture of the very best matting. Mr. Sawyer succeeded in accomplishing his mission with the assistance of a number of guards to see that the plants were not confiscated by the Japanese, as they strongly object to any of such plants being exported to other countries. The *Juncus* were carefully fumigated, as the four baskets were for experimental culture here on the Islands.

In the packages received by mail was one containing acorns attacked by weevil beetles that we confiscated. Thirty-four packages of plants and seed arrived by mail and were carefully examined.

Respectfully submitted,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

DIVISION OF FORESTRY.

ADDITIONS TO THE KOOLAU AND HANA FOREST RESERVES—MAUI.

Acting under the provisions of Act No. 4 of the Session Laws of 1907, the Superintendent of Forestry brought before the Board of Agriculture and Forestry at the meeting held on April 30, 1907, a recommendation to increase the area of government land actually set apart in the forest reserves established in the districts of Koolau and Hana, Island of Maui. Under the old law these lands were included within the reserves but were not subject to the control of the Board in any way. By the proposed action they will be set apart as integral portions of the two reserves. During the period of existing leases all the rights acquired thereunder will continue to be exercised by the lessees, but upon the expiration of the leases, the lands will automatically come into the fully reserved class. The area of the lands to be so set apart in the Koolau Forest Reserve is 15,930 acres; in the Hana Forest Reserve, 7,013 acres.

The advantage of this new law is that it enables adjoining owners and other persons interested to know definitely what the Government's policy will be in regard to certain forest lands when the existing leases run out. In the Koolau Reserve the reservation of these lands fulfills the Government's obligation under the agreement entered into last autumn with the plantations controlled by the Alexander & Baldwin interests.

As usual with forest reserve projects, the report of the Superintendent of Forestry and the resolutions adopted by the Board are published herewith.

RESOLUTION RELATING TO THE KOOLAU (MAUI) FOREST RESERVE.

RESOLVED, That those certain lands in the District of Koolau, Island of Maui, described in general terms as follows: Those portions of the government lands of Honomanu; Keanae, Mauka; Wailua, 1 and 2 Mauka; Wailua-Ulano Forest, two tracts; within the boundary of the Koolau Forest Reserve and containing an area of 15,930 acres, more or less, as recommended in a report of the Committee on Forestry, made on April 30, 1907, based on report of the Superintendent of Forestry, dated April 23, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear

by and on a map made by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 1268," and "Koolau (Maui) Forest Reserve;" and a description accompanying the same numbered C. S. F. 1630, which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as portions of the Koolau (Maui) Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the government lands lying within the boundaries of the said Koolau (Maui) Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as portions of the Koolau Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry, held on April 30, 1907.

RESOLUTION RELATING TO THE HANA FOREST RESERVE.

RESOLVED, That those certain lands in the District of Hana, Island of Maui, described in general terms as follows:

Those portions of the government lands of Koali-Puuhaoa, Wakiu, Kawela-Kaeleku, East Honomaele, and the Hana Forest Tract, within the boundary of the Hana Forest Reserve and containing an area of 7.013 acres, more or less, as recommended in a report of the Committee on Forestry, made on April 30, 1907, based on report of the Superintendent of Forestry, dated April 23rd, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on maps made by the Hawaiian Government Survey Department, marked "Registered Maps No. 1268 and 1750," and "Hana Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1690, which said description is now on file in the said Survey Department; copies of which said maps and description are now on file in the office of this Board and made a part hereof; be approved as a portion of the Hana Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the government lands lying within the boundaries of the said Hana Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as portions of the Hana Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on April 30, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

At the meeting of the Board held on April 30th, 1907, Mr. A. W. Carter, Chairman of the Committee on Forestry, verbally reported that the Committee approved the recommendations contained in Mr. Hosmer's report on a proposed change of status in certain of the lands in the Koolau and Hana Forest Reserves on Maui, and recommended to the Board that the matter be brought to the Governor's attention in the usual way.

By vote of the Board, this report was approved and adopted.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, April 23, 1907.

Committee on Forestry, Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—Act No. 4 of the Session Laws of 1907 amends Chapter 28 of the Revised Laws of Hawaii, by empowering the Governor to set apart government land as forest reserves, whether it is under lease or not, provided that if the land is under lease, the reservation shall not affect the vested rights thereby acquired. Under the terms of this act I hereby recommend the reservation as "lands actually set apart" of the tracts of government land now under lease, within the boundaries of the Koolau and the Hana Forest Reserves on Maui.

The reasons for the creation of the forest reserves on the windward side of Maui were fully discussed by me in former reports. The arguments there set forth apply with equal force to the lands now under consideration, which form integral parts of the two reserves as established. They need not be repeated here.

For purposes of reference it may be stated that my report upon the Koolau Forest Reserve was made under the date of July 28, 1905, published in the *Forester and Agriculturist* for August, Vol. II, pp. 234-240. Reports on the Hana Reserve were made on March 2 and April 6, 1906, published in the *Forester and Agriculturist* for November, 1906, Vol. III, pp. 353-358. The Koolau Forest Reserve proclamation appeared in the *Forester* for September, 1905, Vol. II, pp. 272-273; that of the Hana Reserve in the issue for December 1906, Vol. III, pp. 418-419.

In connection with the setting apart of the lands in the Koolau Reserve it should be borne in mind that in the agreement entered into last autumn between the Government and the Alexander & Baldwin plantations, whereby the manage-

ment of the private land in the Koolau Reserve was turned over to the Board, the Government bound itself:

"That all lands now held and owned by said Territory of Hawaii and that it may hereafter acquire during said period of this surrender, upon such acquisition, within said boundaries hereinbefore specifically set forth, *except* the lands within said boundaries covered by Government leases Nos. 538 and 539, both dated February 26, 1902, made by the Commissioner of Public Lands for and on behalf of the Territory of Hawaii to H. P. Baldwin, shall likewise be immediately set apart as a forest reserve for said purposes, as far as and as soon as it is able so to do under the laws of said Territory.

"That at least immediately upon the relief or release within said period of this surrender of all, or any part, of the lands covered by said Government Leases Nos. 538 and 539, from said leases, or either of them by expiration or termination or otherwise the lands within said boundaries so relieved or released shall be set apart as a forest reserve for said purposes; *but*, if possible under the laws of said Territory at any time within said period of this surrender before such relief, release or releases, then as soon as thus possible, the lands within said boundaries covered by said leases shall be set apart as a forest reserve for said purposes.

"That all lands set apart as hereinbefore specified as a forest reserve and all lands now held, controlled or owned by said Territory of Hawaii, within said boundaries that have already been set apart as a forest reserve for said purposes, shall be used and maintained during said period of seventeen years covered by this surrender as a forest reserve for forestry purposes according to the general purposes of the present forestry laws of the Territory of Hawaii, except where such use and maintenance will be inconsistent with the rights now existing of third persons in any of said lands, in which cases upon the termination of any such right or rights, such use and maintenance shall immediately be in the lands relieved therefrom and shall thereafter continue throughout said period of seventeen years covered by this surrender."

Under the law as it stood before the amendment enacted last month, only the land of Honomanu, 2,000 acres, in the Koolau Reserve and the small portions of E. Honomalele and the Kawela-Kaeleku tract, 80 acres, in the Hana Reserve could be set apart. The advantage of the amendment is at once apparent when in these two reserves alone it permits 22,943 acres to be put into the permanently reserved class.

That there may be no misunderstanding of the terms of the present law I may again remark that the reservation goes into full effect only on the expiration of the existing leases, all

rights acquired thereunder being guaranteed to the lessee during the term of the lease.

For the reasons above set forth I now recommend that the Board requests the Governor, to set apart, after the hearing required by law, the portions of the following named government tracts within the boundaries of the Koolau and Hana Forest Reserves as integral parts of those reserves.

Following is a list of the lands to be so set apart:

KOOLAU FOREST RESERVE.

Honomanu, 2,000 acres; Lease No. 52; Expires July 1, 1908.
 Keanae, Mauka, 8,750 acres; Lease No. 539; Ex. Feb. 26, 1923.
 Wailua, 1 and 2, Mauka, 1,280 acres; Lease No. 539, Expires Feb. 26, 1923.
 Wailua-Ulaine Forest, 3,000 acres; Lease No. 538; Expires Feb. 26, 1923.
 Wailua-Ulaine Forest, 900 acres; Lease No. 492; Expires May 1, 1917.
 Total—15,930 acres.

The first three lands were "crown lands."

HANA FOREST RESERVE.

Hana Forest, 6,330 acres; Lease No. 492; Expires May 1, 1917.
 E. Honomalele, 15 acres, Kawela-Kaeleku, 65 acres; Lease No. 474; Expires Aug. 17, 1908.
 Wakiu, 3 acres; Lease No. 518; Expires May 2, 1920.
 Koali-Puuhaoa, 600 acres; Lease No. 479B; Expires Dec. 5, 1913.
 Total—7,013 acres.
 Total area in Koolau and Hana Forest Reserves—22,943 Acres.

Very respectfully,

RALPH S. HOSMER,

Superintendent of Forestry.

*BOARD OF AGRICULTURE AND FORESTRY.***DIVISION OF FORESTRY.**

NA PALI-KONA FOREST RESERVE—KAUAI.

At a meeting of the Board of Agriculture and Forestry, held on April 30th, 1907, the project to create a forest reserve on the high plateau on the leeward side of Kauai, known as the Waimea Upland was approved. The proposed Na Pali-Kona Forest Reserve contains a total area of 60,040 acres, of which 40,650 acres is government land. The major part of the government land (36,670 acres) is held under several leases, each of which has some years yet to run. But under the provisions of Act No. 4 of the recently enacted Session Laws of 1907 this area can be set apart at once as a portion of the reserve, subject to the rights existing under the leases. The remainder of the government land (3980 acres) is unleased and can be fully reserved immediately.

In accordance with the usual custom there are published herewith the report of the Superintendent of Forestry upon this proposed reserve and the resolution adopted by the Board in regard thereto.

**RESOLUTION RELATING TO THE PROPOSED NA
PALI-KONA FOREST RESERVE.**

RESOLVED, That those certain lands in the Districts of Na Pali and Kona, Island of Kauai, bounded in general terms as follows:

Lying on the Waimea Upland, bounded on the South and West by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons; on the Northwest by the palis of Na Pali District; on the North and East by the Districts of Halelea and Puna; and on the Southeast by the land of Wahiawa, and containing an area of 60,040 acres, more or less, as recommended by the Committee on Forestry on April 30, 1907, based on a report of the Superintendent of Forestry dated April 22, 1907, which report is on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on maps made by the Hawaiian Government Survey Department, which said maps are now on file in the said Survey Department, marked "Registered Map Nos. 2246 and 2375," and "Na Pali-Kona Forest Reserve, Kauai;" and a description accompanying the same, numbered C. S. F. 1757, which said de-

scription is now on file in the said Survey Department; copies of which said maps and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the Na Pali-Kona Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the Government lands lying within the boundaries of the said proposed Na Pali-Kona Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Na Pali-Kona Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry, held on April 30, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, April 22, 1907,

At the meeting of the Board held on April 30, 1907, Mr. A. W. Carter, Chairman of the Committee on Forestry verbally reported that in the judgment of the Committee the property mentioned in the report of the Forester should definitely and for all time be set apart as a forest reserve. It is essentially forest land and is of greater value for a forest reserve than for anything else. The land cannot advantageously be utilized for any other purpose. The bulk of the property is at a very high elevation and includes many gulches and ridges. A large portion of the area is now very heavily wooded. This property has a tremendous value as a source of water supply to the adjacent agricultural lands.

On behalf of the Committee Mr. Carter recommended that the report of the Forester be adopted and that the usual request be made to the Governor as regards a public hearing.

It being duly moved and seconded, the Board voted to adopt the report of the Committee on Forestry and to request the Governor to take the action desired.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, April 22, 1907.

Committee on Forestry, Board of Commissioners of
Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report, with recommendations, upon the project to create a forest reserve in the Districts of Na Pali and Kona on the Island of Kauai. The report is based on a personal examination of the locality made by me during the summer of 1906, supplemented by information obtained during previous visits to Kauai and in other ways.

LOCATION.

The section proposed to be reserved is the high table land embracing the upper part of Na Pali and Kona Districts. The area is roughly rectangular in shape, some fifteen miles long by some six miles wide, with the major axis running N. W. and S. E. The tract may be described in general terms as that portion of the Waimea Upland, embracing the mauka portion of the Districts of Na Pali and Kona, Island of Kauai, which is bounded on the South and West by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons; on the Northwest by the palis of Na Pali District; on the North and East by the Districts of Halelea and Puna; and on the Southeast by the land of Wahiawa. The area included within the boundary thus described is given by the Survey Office as 60,040 acres.

OBJECT.

The purpose in setting apart this section as a forest reserve is essentially that of forest protection. In the area within the boundary above outlined are a number of streams of great potential value for the development of power and for irrigation. The object of the proposed Na Pali-Kona Forest Reserve is permanently to protect the forest on the catchment basins and at the headwaters of these streams against injury of all kinds, that the forest cover may be kept intact and permitted to exert its influence on equalizing and maintaining the flow, as well as by helping to prevent erosion. This last feature is important because it is very desirable that as little material as possible be carried down stream in time of flood, to be deposited on the arable lowlands and also because clear water is an item well worth considering where a stream is to be harnessed to drive power wheels.

Another benefit to be obtained from his reserve is the influence on precipitation that under certain meteorological conditions is unquestionably exerted by a body of forest of the size, and so situated as is that on the Waimea upland. The laws that control the relation of forest and rainfall are not yet understood but the result of their action is sufficiently tangible, in these islands at any rate, to justify their being reckoned with.

DESCRIPTION.

The proposed Na Pali-Kona Forest Reserve is made up of a few large lands which are at present controlled by a few persons only. The following table gives the names of the several tracts with the area and other information in regard to each. It is based on data furnished by the Survey Office:

NA PALI DISTRICT.

Na Pali, 130 acres; leased to W. E. H. Deverill; Lease No. 345; Expires July 1, 1913.

Na Pali, 6360 acres; leased to W. Kinney; Lease No. 453; Expires July 7, 1917.

Na Pali, 3980 acres government land, unleased.

Total—10,470 acres.

KONA DISTRICT.

Waimea, 5808 acres; leased to Knudsen Estate; Lease No. 164; Expires June 1, 1920.

Waimea, 3110 acres; leased to Gay & Robinson and transferred to Knudsen Bros.; Lease No. 112; Expires Dec. 27, 1917.

Waimea, 21,262 acres; leased to Gay & Robinson; Lease No. 112; Expires Dec. 27, 1917.

Makaweli, 10,030 acres; owned by Gay & Robinson, fee simple.

Koula and Manuahi, 9360 acres; owned by Gay & Robinson, fee simple.

Total—49,570 acres. (Area government land, 30,180 acres.)

Total area in Na Pali and Kona Districts—60,040 acres.

TOPOGRAPHY.

The Waimea Upland is a high plateau very much broken by branching, deep-cut canyons. The average elevation of the summits of the ridges is between 3000 and 4000 feet, the land sloping back gradually to the high ridges in the center of the island that make its back bone.

The upland is divided into three watersheds, the drainage areas of (1) the Hanapepe River, (2) the Waimea River and (3) the various streams that empty directly into the ocean in the Na Pali District. In all essential characteristics the topography of these three systems is of the same order, save that in the canyons of the East and West forks of the Waimea River, the process of degradation has gone further, with the result that larger canyons have been formed, with a greater number of lateral branches.

In the Waimea watershed erosion has gone on so far in the main canyons that the floors of the valleys are cut down to within a few hundred feet of sea level. From the narrow stream bed the canyon walls rise precipitately, in many cases for several hundred feet sheer, while for the remainder of the two thousand or more feet to the top of the canyon, the palis are hardly less steep.

From each of the lateral valleys streams of varying size drop in cascades into the main canyon, bringing motion into

the picture and adding another hue to the bright colors of certain of the outcropping strata.

These features, with the depth of the canyons and the bold sculpturing of the sharply cut dividing ridges into pinnacles and castleated outposts, make the section one of great scenic interest. Indeed in a reckoning of the natural beauties of the Hawaiian Islands the canyons of Kauai, and particularly those of the Waimea and Makaweli Rivers, are to be listed near the top.

The Hanapepe Valley is perhaps not less wonderful than its neighbors to the westward but its beauty is of a different order from that of the great cleft in the island that has been cut by the waters of the Waimea.

In each of the larger valleys at an elevation of about 3000 feet there outcrops a hard stratum that marks the top of all the principal waterfalls. This impervious layer seems to be continuous over a considerable area as it appears in both the Na Pali and the Waimea Districts. It is of more than passing interest because of the part that the waterfalls it controls may some time play in a program of power development.

All the larger tributary canyons carry streams that during the rainy season contain considerable bodies of water. So far as I could learn no systematic measurements had ever been made of the water in these upper streams.

At present water is diverted for irrigation at waterheads in the Hanapepe, Olokele and Waimea Rivers, the last named stream now being tapped in two places, while a third ditch is in process of construction. The water goes to irrigate the cane fields on the neighboring sugar plantations. So far no power has been developed on any of the streams in this section. It is understood, however, that with the completion of the Kekaha Plantation ditch, the ditch that taps the Waimea stream highest up, power is to be developed by dropping the water at two points.

On the plateau is much swampy land, especially in the depressions at the heads of the larger gulches. Here the bottom is at times so soft as to make thorough exploration difficult, if not hazardous; a condition that is, however, admirably adapted for water conservation.

THE FOREST.

With the exception of the steep walls of the canyons practically all of the area within the proposed reserve is covered with forest, which protects the swampy ground-cover and makes the section particularly well adapted to absorb and retain the rain water.

A notable feature of the forest on the Waimea, upland is the large number of fine specimens of a considerable variety of forest trees not commonly found in the Hawaiian forests.

Ohia lehua (*Metrosideros polymorpha*) predominates among the trees in mixture. Other important tree species are Koa, (*Acacia koa*), Koolea (*Myrsine lessertiana*), Kopiko (*Straussia*), Ohia ha (*Eugenia sandwicensis*), Iliahi or Sandalwood (*Santalum freycinetianum*), and Kauwila (*Alphitonia ponderosa*).

Among a goodly number of small trees and high shrubs special mention may be made of the Lobelia a characteristic and very noticeable plant in the forest at this elevation, where it reaches its best development.

To both the forester and the botanist the forest on the Waimea Upland is one of the most interesting regions in the Territory, for it is full of problems, the solution of which presents attractive rewards to the scientific investigator.

ENEMIES OF THE FOREST.

Wild Cattle.

In former years cattle grazing was carried on both on the private land of Makaweli and the government land of Waimea. Although this use of the land has now been discontinued for some years there still remain in the forest bands of wild cattle. On the portion of Waimea to the west of the Waimea-Poomau canyon systematic extermination of the wild cattle in the woods was begun by the Knudsen Estate over twenty years ago and continued until the wild cattle were practically all got out or killed. Since 1898 a forest fence, built and maintained by the firm of Knudsen Brothers, has prevented the Knudsen ranch cattle from getting into the forest, which has been treated by the lessees as a private forest reserve.

On Makaweli the extermination of the wild cattle was begun later but for the last few years has been very vigorously carried on by Messrs. Gay & Robinson, with the result that the bands of wild cattle are greatly reduced in number. Under the direction of Mr. Gay a comprehensive system of trails has been constructed that greatly facilitates the hunting of the wild cattle. It is the intention of Messrs. Gay and Robinson to continue this work until the wild cattle are exterminated.

As all ranch stock is kept at the lower levels, the forest within the reserve boundary may properly be regarded as a private forest reserve. It is the intention of Messrs. Gay and Robinson that it be kept so.

Goats.

The other principal source of injury to the forest in the reserve is from the wild goats. These animals live on the cliffs and are found in each of the large valleys both in the

Kona and Na Pali Districts. The goats are doing much damage by destroying the scanty vegetation on the steep canyon sides and exposed ridges, thus allowing erosion to go on more rapidly, with the result that more debris falls into the valleys and that the side gulches work back faster into the upland. At different times in the past there have been goat hunts and as occasion now offers a few goats are killed but as it is now carried on this work does little toward checking the increase of this pest. Systematic and continued hunting by well trained mountaineers seems to be the only effective way of getting rid of the goats. It is hoped that later, work of this sort can be undertaken as a part of the administration of the reserve.

Fire.

The Waimea Upland has been remarkably free from forest fires. On the Gay and Robinson lands this is doubtless due in large part to the policy of that firm in fining the person who lets the fire start, the fine so collected going into a fund out of which every one who helps put out the fire is liberally paid. It thus becomes an object to respond promptly when the alarm comes. Consequently few fires spread over any considerable area. A system of this sort can of course be made effective only where all the people of a given section are in the employ of a single interest.

PRIVATE RESERVES.

The action of the Knudsen Brothers and Messrs. Gay and Robinson in protecting the forest from fire, in getting out the wild cattle and in keeping their ranch stock outside the boundaries of the forest has resulted in fact, though not in name, that the area now proposed to be officially set apart has for some years been a private forest reserve.

The creation of the Na Pali-Kona Forest Reserve will officially recognize the reservation and give permanence, on the government land, to an arrangement that less far sighted lessees might not see fit to continue. The control of the government land during the term of the existing leases and of course that of the fee simple property vests in the present lessees or owners, unless some agreement as to forest management is voluntarily entered into with the Government. It is the intention of both the firms named to continue to manage the forest lands under their ownership or control as they have been doing in the past few years. This puts the matter on a satisfactory basis and is a program that at this time the Government is not prepared to improve on.

THE RESERVE BOUNDARY.

In fixing the limits of the Na Pali-Kona Forest Reserve, advantage has been taken as far as possible of natural boundaries. On the north and east sides it follows the district lines along the main dividing ridge of the island, the proposed reserve joining the head of that in the Halelea district. On the northwest in Na Pali District the line adopted follows the impassible cliff, leaving outside the reserve all the arable land in each of the valleys and on the flats, where there are any, along the connecting trail.

From the Kauhao cliffs to Puuhinahina, on the edge of the great Waimea canyon, an arbitrary line was chosen, principally because in about the location where the line was desired there existed a securely built fence that had since 1898 been maintained by the Knudsen Brothers as the lower boundary of the forest, above which fence cattle had not been allowed to go.

Across the canyon section the line is carried from one prominent point to another—as it also is across the private lands of Makaweli and Hanapepe. This section is for the most part naturally protected and where the upper levels are accessible to cattle a few short stretches of fence across narrow ridges would completely isolate the area above the line.

In the section east of the Waimea canyon below the forest line the flats on the lower ridges are sufficiently large to be valuable as grazing land. These ridges have long been without forest and are now covered by a dense stand of lantana, the spread of which has now been checked by its insect enemies. Were the lantana got out the area might well be stocked again with useful grasses and become good grazing land. Because of the limited amount of pasture on Kauai it is important that areas which legitimately can be put to this use be not interfered with. The lack of water and the difficulty of irrigation make it doubtful if these detached flats could be used advantageously for more intensive forms of agriculture. Across the private lands of Makaweli and Hanapepe the location of the line was discussed with, and meets the approval of the owners, Messrs. Gay and Robinson.

The only points that now remain to be considered are a few small open flats within the reserve and one or two little park-like valleys on the western side of the Waimea canyon. In one of these valleys, at a place called Halemanu, is a mountain camp maintained by the Knudsens, and nearby is another built by Mr. Faye, manager of the Kekaha Plantation. In my judgment the best use to which such areas can be put is as sites for recreation camps and mountain houses. And I believe that with proper restrictions and limited, non-transferable leases, these areas can be so used without detriment to the

objects of the reserve and to better advantage than in any other way. The areas of open land are at too high an elevation, too restricted in size and too far distant from the coast to have other value than for some such purpose.

The only agricultural land in the canyons inside of the forest line is found in the Koaie gulch, a branch of the Waimea canyon. This area, which could be used for grazing, has been excluded, by description, from the Reserve. The area is 530 acres.

RECOMMENDATION.

On the basis of the facts herein set forth I now recommend that the Board requests the Governor to create as the Na Pali-Kona Forest Reserve the area within the boundary hereinafter technically described and to set apart as portions thereof, after the hearing required by law, the unleased portions of the government land in the District of Na Pali (to be set apart definitely and at once) and the leased portions of the government lands of Na Pali and Waimea (to be set apart under the provisions of Chapter 28 of the Revised Laws, as amended by Act No. 4 of the Session Laws of 1907), within the boundary of the Na Pali-Kona Forest Reserve.

DESCRIPTION.

[Here follows in the original a technical description of the Reserve boundary, prepared by the Survey Department. It is here omitted as it also forms a part of the official proclamation, to be published in full in a later issue.]

Very respectfully,

RALPH S. HOSMER,

Superintendent of Forestry.

BY AUTHORITY.

Notice is hereby given that C. S. Holloway, Esq., has been appointed President of the Board of Agriculture and Forestry, vice W. M. Giffard, resigned.

A. L. C. ATKINSON,
Secretary of Hawaii.

Executive Building, Honolulu, May 21, 1907.

DIVISION OF ANIMAL INDUSTRY.

Rule 4.—To amend Rule 1 of the Division of Animal Industry governing the inspection and testing of imported live stock.

It having been found impracticable, for want of competent inspectors, to have horse stock (including mules and asses) and cattle submitted to respectively the mallein and the tuberculin tests at any other port than Honolulu, it is ordered that paragraph 4 of Rule 1 of the Division of Animal Industry of this Board be and is hereby amended to read as follows:

"Until further notice the port of Honolulu shall constitute the only port for horse stock and cattle, unless the same shall be accompanied by certificates of mallein or tuberculin tests as provided for in Rule 2 of the Division of Animal Industry of this Board."

Any violation of this rule is a misdemeanor.

This regulation shall take effect at once.

W. M. GIFFARD,
President and Executive Officer,
Board of Agriculture and Forestry.

Approved May 2, 1907.

G. R. CARTER,
Governor of Hawaii.

ACT 112.

AN ACT

TO AMEND SECTION 390 OF THE REVISED LAWS OF HAWAII.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. That Section 390 of the Revised Laws of Hawaii be and the same is hereby amended to read as follows:

"Section 390. Penalty for Violations. Any person violating any of the provisions of this Chapter, or any rule or regulation of the Board of Commissioners of Agriculture and Forestry, and any master of any vessel which shall bring into this Territory any article which the Board shall at any time prohibit from being imported into this Territory; and the master of any vessel from which shall be landed any article in this Chapter required to be inspected, until he shall have received a permit to land the said articles from the Board or its officer or inspector, as in this Chapter provided, shall be guilty of a misdemeanor and shall be punished by a fine not to exceed five hundred dollars.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 30th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

190 to 202 - U/K

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 83 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii," General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii," General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

* Out of Print.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. IV

JULY, 1907

No. 7

MENDEL'S LAW OF BREEDING.

An Address Before the Hawaiian Poultry Association by
Philip L. Weaver.

For many years breeders of horses, poultry and pet stock, florists and expert gardeners have been working with a conscious basis of the laws of inheritance. Like begets like is a general rule on which they have worked out their standard bred stock. Many experts have more or less clear ideas of the basis of their success, but often they had no power to generalize from their expert experience to crystalize their experiences into a rule or law of breeding. They are the so-called "practical" men who sniff at theory, not knowing that consciously or unconsciously every dealer with the laws of nature must act on a theory before he can produce results otherwise than by pure accident.

Especially is this true with illiterate breeders of horses and poultry. Years of experience has taught them how to arrive at results in certain cases, but they can not or will not give out any general rule on which the inexperienced can act with any understanding. I am impressed with the amount of literature published nowadays on the raising of domestic fowls, and out of that literature how little is based on clear thinking applied to the experience of the writer and clearly expressed.

BREEDING FROM A SPORT.

We know that the White Plymouth Rock was developed by a long line of breeding from a "sport" of the Barred Plymouth Rock fowl, itself an artificial variety produced by crosses of several existing varieties. We know that by careful breeding the barred color was bred out of the strain until now White Plymouth Rock fowls breed true. When asked how this is done, too often the answer is not definite. The chicken men say "By careful breeding." But, what is careful breeding? Is there some mystery that the uninitiated are not supposed to know? Or is it that the expert himself does not know how to formulate rules of breeding for others to follow.

I propose to set down a synopsis of what scientific men to-day have discovered and believe to be a true law of breeding.

If the practical breeder will listen to the teachings of scientific breeders for more than forty years past, he will find a great light let into his groping task of establishing a new variety of plant or animal. This aid would apply to the poultry man as well as to all other breeders.

I have read many works and papers on poultry and how to breed them, but I have not yet seen therein any reference to Mendel's Law of Breeding. This law is now generally received by the most learned investigators to be established as a fact.

ABBOT MENDEL.

Abbot Mendel was an Augustinian Monk of Brunn in Austria who conducted extensive experiments with cultivating peas in his monastery. He published the result of his experiences in two modest papers about forty years ago, but his work attracted little attention, probably because of the scientific excitement over the discussion of the Darwinian Theory of the Origin of Species through natural selection. In 1901 De Vries in Holland, Correns in Germany, Tschermak in Austria and Speelman in America, rediscovered the same principles of heredity independently, which are now known as "Mendel's Law." Dr. Castle and others have conducted extensive experiments with guinea pigs and white mice which have resulted in a demonstration of the truth of the law. I quote on this subject from a work by Metcalf on Organic Evolution, page 44:

CASTLE'S EXPERIMENT WITH MICE.

"Castle bred white mice and common gray mice together and got the following results: The offspring developed from the first cross were all *apparently* normal gray mice. When, however, a male and female from this first lot of young were bred together very interesting results were obtained. Three-fourths of the young of this second lot *appeared* to be normal gray mice, but one-fourth were found to be *pure white mice*. If two of these white mice were bred together they had white offspring, and the same was true in breeding again from their young, generation after generation, showing that they were of pure strain without admixture from the gray variety, though the original parents in the first cross were one gray and one white.

"It is of great interest to note that, in spite of the crossing of the two varieties, there appeared in the later generations certain individuals which were of pure blood showing no trace

of the admixture which we would expect to find resulting from the cross. Extensive experiments in breeding showed that the results were to be interpreted as follows:

RESULTS.

"A gray mouse 'G' bred with a white mouse 'W' gave offspring which seemed to be all gray, but were really a mixture of gray and white, the gray character being '*dominant*' and the white character '*obscured*' or '*recessive*,' as Mendel called it.

"That is $G \times W$ gave: $G (W)$, $G (W)$, $G (W)$, etc., the parenthesis indicating that the white character was recessive. This hidden complex nature of the second generation (the young from the first cross) was clearly indicated when they were bred together. It was found that their offspring was of three sorts, and that these three kinds were in definite and numerical proportions.

" $G (W) \times G (W)$ gave offspring:

"1 $G + 2 G (W) + 1 W$: one-fourth being pure gray, one-fourth pure white, and one-half apparently gray, but really as further breeding showed, gray and white, the white character being recessive and obscured. These numerical proportions held true for an extensive series of experiments in the case of white mice, as they had done in the experiments of Mendell upon certain plants."

SPORTS.

"Very divergent individuals which arise by variation are commonly called 'sports.' It is easy to see that if a single brood of sports arose which were especially well adapted to their environment, although they might breed with non-divergent individuals of the species, yet among the offspring of the third generation there would be individuals like the original sports."

From this statement of the rule it is evident that the breeder can by selection change the character of the species from the old type to the new type (represented by the sport) by selection and elimination.

It should be stated that Mendel, and Dr. Castle and others who succeeded him found the rule not without exception, for Dr. Castle found that in breeding white and gray mice, that a certain proportion of the offspring from the first cross were not gray or white, but dappled gray and white, and not as we would expect from Mendel's Law.

Having given a bird's-eye view of the subject let us go more fully into Mendel's experiments in detail.

MENDEL'S EXPERIMENTS WITH PEAS.

He experimented with garden peas. All progeny from each cross were kept separate for a number of generations. He selected contrasted characters which are alternative. Seeds, round or angular; pods wrinkled or smooth; stems tall or dwarfed. Take for example his experiments in crossing peas differing only in color of the cotyledons, viz: yellow and green. All the crosses resulting from yellow vines pollinated from green vines were yellow seeds only. There were found to be no green seeds, and no intermediate ones. This characteristic of the crosses is especially to be noted. Mendel applied the term "*dominant*" to the tendency of the yellow color to dominate over the green color. The green color was suppressed in the first generation of crosses, therefore called this "*recessive*."

All the seeds were then grown and the plants of the third generation set seeds. It was found that the third generation differed from the second. They were found to be partly yellow and partly green in the proportion of three yellow dominant characters to 1 green or suppressed color. The actual figures were as follows:

258 seeds apparently yellow, were produced by crossing yellow with green varieties.

258 hybrids when crossed together produced 8023 plants 6022 yellow species to 2001 green species or 3 to 1.

In the second generation 519 seeds resulted in 353 yellow and green mixed and 166 yellow.

The result may be expressed as follows, D representing "dominant" and R "recessive":

Ovules fertilized by pollen, result in the following progeny combinations:

$(D + R) \times (D + R)$, which is equal to:

$D^2 + 2 D R + R^2$, which may also be expressed:

$D D + D (R) + (R) D + R R$.

The recessive or green seeds, R. R. above, when bred together will not produce any but green seeds. They breed true. But the dominant seeds or yellow all look alike, (the pure stock D D that when bred together breed yellow, true, and the D (R), (R) D, which are apparently yellow, but when bred together do not breed true.) To separate the pure dominant stock, yellow, D D in the diagram, it is necessary to test out the hybrids by self-pollinating each of the plants produced from the yellow seeds. The dominant class D D, or pure yellow stock, will produce yellow seeds alone, while the hybrids D (R), (R) D, apparently yellow, with suppressed green characteristics, will again produce yellow and green seeds in the proportion of 3 to 1.

Thus the D D, or pure seeds of the strain, may be tested out and used to breed true. This result reached by Mendel forty years ago, was further tested and proved recently by Dr. Castle in experiments on guinea-pigs or caviae.

EXPERIMENTS WITH GUINEA PIGS.

He wanted some rough-coated, "rosetted" albino varieties. In order to produce these he commenced with caviae possessing rough-pigmented or colored coat, and albino smooth coat. Observe that the problem was complicated by two alternative characteristics. He had to breed not only for color, as the peas were cultivated, but also for rough or smooth hair in addition. Experiments showed that the rough coat is alternative with, and dominant over, the smooth coat, and also that pigmented or colored coat is dominant over white coat.

Crossing rough colored or pigmented with smooth albinos it was found that hybrids were produced all of which exhibited only the dominant characteristics, viz: the rough and colored coat.

When bred together the above resolve themselves up into nine categories, though the characteristics are not all apparent. In only three out of sixteen offspring did the hidden or recessive characteristic of albino color and smooth coat appear. The result of three to one was therefore demonstrated. The breeder using Mendel's law would test each rough coated albino for purity, by crossing each with a smooth coated albino, which contained recessive qualities only. The result would be that about one-third of the rough white caviae would produce to this cross only progeny similar to themselves. Others would produce mixed three rough and one smooth albino, and those would be rejected as hybrids.

By this test the individuals of the dominant character D D may be determined without any recessive character D (R), (R) D. They are pure and will remain so.

SEGREGATION AND DOMINANT CHARACTERS.

From these experiments we have two elements, segregation in breeding, and dominant characteristics.

The mathematics of segregation is understood from the nature of the development of the germ cell, but the cause of the characteristic of dominance is a mystery. It is found to be an important element to be reckoned with.

SPECIFIC RESULTS.

With these applications the law becomes a working rule, and poultry breeders with others may intelligently breed in a

characteristic with some precision and intelligence. A distinctive characteristic developed in a sport may be bred in to order, as was done by the breeder of the White Plymouth Rock a "sport" of the Barred Plymouth Rock, an "albino" of that breed which has become a standard variety.

The hit or miss system of breeding from large numbers of individuals to get a result may be reduced to an exact testing out of the individuals which will not breed true, leaving the pure bred stock. There is no mystery about the process of creating a new characteristic in a variety when we understand Mendel's Law, now an accepted rule among scientific men, and poultry men among others should understand it.

Briefly expressed, Mendel's Law may be stated thus:

In the second and later generations of a hybrid, every possible combination of the parent characters occurs, and each combination appears in a definite proportion of the individuals."

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

REPORT OF HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, Hawaii, June 28, 1907.

To the Honorable Board of

Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Since my last report one month ago I have to report the arrival of 68 steam and sailing vessels from outside the Territory on part of which we found 13,552 packages of fruit and vegetables, 9 bales and cases of trees, plants, etc., and 87 packages of plants and seeds by mail. Two bales of trees arrived from Iowa in very bad condition owing to being badly packed in straw and burlap so that the air passed through the bales and the trees and plants were dried up. A large case of orchids arrived from England in good condition after their long journey. We destroyed a few small lots of fruit brought by passengers from the Orient. As it was of no great value we preferred not to take the chances of introducing any fruit flies that are found in certain fruits in those countries. On the S. S. "Siberia" arrived from the Orient April 22nd a case of sugar cane cuttings, the latter had been dipped in parafine wax. I had the case and cuttings fumi-

gated with hydrocyanic acid gas to prevent the escape of any insects. I then submitted a small section of the cane to Dr. Lewton-Brain, the pathologist, as it had evidence of disease and the following is his report thereon:

"I have examined the specimens of diseased cane you submitted to me this morning, after a thorough disinfection. The sticks were evidently very badly diseased and as the discoloration had not yet extended to the end, it seems certain that they were infected to begin with and did not become so while in transit. I am sorry I cannot identify the disease, but I could not discover any fructification of the fungus, nor do we know enough of Oriental cane diseases for me to identify this from the symptoms.

"The symptoms do not agree with any Hawaiian cane disease known to me and though, as I have said, we know little of Oriental cane diseases, the probability is that there are some which are unknown elsewhere altogether, therefore, it would be highly unsafe to admit these canes into these islands, and the sooner they are destroyed the better."

The cane and case were burned in a furnace near the dock.

In April we received a strong colony of internal parasites of the citrus aphid from Mr. E. M. Ehrhorn of California. We liberated several colonies of this valuable little hymenopterous parasite on orange trees infested with the orange aphid in the suburbs of Honolulu and on the 2nd day of May Mr. Kotinsky liberated a strong colony at Wahiawa. We are in hopes that they will reduce the number of that dirty orange pest.

During the past two weeks my assistants, Mr. Kotinsky and Mr. Jordan, have been distributing colonies of the "horn fly parasite" (*Eucoila impatiens*) in various stock breeding districts and it is satisfactory to know that the colonies are becoming well established.

Colonies of the "Torpedo fly" (*Siphanta*) egg parasites were sent to Inspector Newell of Hilo about a year ago and have increased so rapidly that he has been able to send out colonies free to parties that have made application to this office for them.

Mr. Kotinsky and I have made another inspection tour of the various small Indian mango trees that were fumigated for the mango scale and found that good work has been done. The scales were dried up. A visit to the estate where the original imported Indian mango trees were planted, that was fumigated nearly a year ago, showed to have made a very satisfactory growth and we found no trace of living mango scales.

Respectfully submitted,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

THE CAMPHOR INDUSTRY.

An Address Before the Fifth Annual Meeting of the Farmers' Institute of Hawaii by Leopold G. Blackman.

So many new agricultural enterprises have been advocated of late, as offering alluring prospects to the Hawaiian cultivator, that one is somewhat reluctant in suggesting another. Still it appears expedient that this Territory should exert every means to develop to the full the productive capacity of its available land, and in view of the very great diversity of condition offered by our various soils and altitudes, this can only be accomplished by having recourse to many different agricultural enterprises. If, however, after a consideration of the merits of the camphor tree, it be not decided to include its cultivation among those agricultural undertakings already established here, the preparation of this paper will not have been altogether useless, for it will assist Hawaiian planter to weigh the merits of a new industry which is now attracting considerable attention among tropical growers of other countries.

SOURCE OF SUPPLY.

The production of camphor is at present almost exclusively confined to Formosa. The camphor forests of this large island, when first visited by Europeans, were very extensive and reached well into the plains. Improvident harvesting, however, gradually reduced them, although fifty years ago they still covered the lower ranges of the mountains now occupied by tea and other gardens. At that time the demand for camphor was comparatively limited, and the price in consequence was much lower than has prevailed of late years. The work of destruction of camphor trees, however, continued steadily, and the denudation of the forests, coupled with an incessant warfare between the Chinese, who controlled the trade, and the inhabitants of Formosa, disorganized the production and rendered the procuring of camphor more and more difficult. These unsettled conditions exercised a direct influence on the price of the commodity, which has perhaps fluctuated as greatly as that of any other agricultural product, with a general tendency always to advance. Since the occupation of Formosa by Japan, a few years ago, the latter country has controlled the production and export of camphor, and has established a government monopoly in this industry, which it jealously guards. The chief result to the consumer of this restriction in trade has been an advance in the price of camphor of about fifty per cent. Another effect which has been brought about, has been the steady decline of the refining of camphor in Europe and the United States, in which countries many refineries of crude camphor have abandoned business, and the process may now be said to have passed into the control of the Japanese.

SUPPLY AND DEMAND.

Hitherto, the export of camphor from Asiatic countries to America and Europe has amounted to about eight million pounds per annum, of an approximate value of two or three million dollars. As the production of camphor has hitherto been unscientific and improvident, and has been achieved only at the total destruction of the tree which produces it, there has for some years been a gradual and appreciable diminution of the available supply. At the same time the uses of the commodity have greatly increased. These two factors combined, which have a close parallel in those which have affected the rubber market, have brought about a marked advance in the price of camphor, which will probably continue for many years. Indeed, as the Formosa natural forests become exhausted and the demands of the smokeless powder and celluloid makers increase, it is impossible to predict to what extent the price may advance, until affected by the scientific cultivation of the tree. Demand has, however, obtained such a start in the race against supply, that the latter, hindered with the handicap of some few years necessary to the establishment of plantations and the determination by experiment of the best methods of production and refinement, must necessarily take a long period to bring about a proper economical balance between these two factors. At present there appears very little prospect of low prices and the grower of camphor has at least as alluring an incentive in the way of an eager market, as is held out to the rubber planter. As the camphor now produced is practically confined to the Orient, the establishment of the industry in Hawaii is one of promise, as it would be in a most advantageous position to supply the home market and would have in addition the benefit of the tariff, with which the foreign grower has to contend.

HISTORY OF CAMPHOR.

The word "camphor" is found with various alterations throughout all oriental languages, and this similarity indicates that a knowledge of the value of the tree has long been known and has probably been derived from a common source. It is mentioned first, in Arabic literature, as early as the sixth century, and Marco Polo relates that he saw large forests of this handsome tree.

DESCRIPTION AND PROPERTIES.

Camphor is a vegetable product obtained generally by wood distillation, but it is also sparingly found as a natural secretion. It exists as a white translucent crystalline mass, of a characteristic pungent odor and a peculiar acrid disagreeable taste. It is generally very tenacious and practically impossible to pulverize without the addition of a small quantity of alcohol, when it disintegrates readily upon pounding. It burns with a yellow flame and

leaves no residue. It is volatile, almost insoluble in water, but readily so in alcohol, from which it is precipitated by the addition of water. It floats on the latter fluid upon which small particles of it rotate until oil is added.

USE.

One very interesting feature connected with this subject, is the various uses to which this valuable product has been put at different periods. In the early ages it was regarded chiefly as a costly perfume, and it still finds a place in the perfumer's art. It afterwards was included into the realm of medicine by the compilers of the medieval pharmacopœia, together with many other ingredients of often less delectable a nature and smaller claim to merit. To this day it is regarded as a specific for certain ailments by homœopathic and allopathic practitioners alike. Its chief use at present is in the manufacture of the two modern products, smokeless gunpowder and celluloid, and to the makers of these articles is to be attributed at once the growing demand for camphor and its quickly advancing price.

CAMPBOR WOOD.

The wood of the camphor tree is in great demand for cabinet work. It is of a beautiful yellow color and possesses a soft silky texture. It has the property of resisting the ravages of insects and its aromatic odor enhances its value for many purposes. The tree has the additional quality of possessing hygienic value. This has long been recognized in Japan where it is regarded with great veneration and may frequently be seen growing in the vicinity of temples. By no means the least valuable property of this article, and one which is probably little known, is its ability to improve the germinating property of seed. A small piece of camphor dissolved in water will not only hasten and improve the vitality of seed soaked in it, but is also of use in stimulating into growth, cuttings of rose and other plants, which have been subjected to long journeys.

ORIGIN OF CAMPBOR.

Camphor is produced by several different species of trees, chief among which is *cinnamomum camphora*, a native of Eastern Asia. This may be regarded as the camphor tree proper. It is an exceedingly handsome evergreen, which reaches a height of over one hundred feet. This tree, the source of Formosa camphor, is now being cultivated not only in Ceylon and India, but also in California and Florida and in many European countries, notably France and Italy. It is said that a large tree will yield over a thousand dollars worth of camphor.

Another, though less known camphor yielding tree, is the *Dryobalanops camphora* of Sumatra, which produces what is

known as Malay camphor. The crystals of this tree are found in clusters under the bark, in knots, and occupying longitudinal fissures in the heart of the tree. In order to obtain it, the trees are destroyed by the natives who are said to often procure about ten pounds from a mature tree.

FORMOSA OR CHINESE CAMPHOR.

Formosa camphor has hitherto been shipped to Europe and America through Chinese ports. For this reason it is generally known as Chinese camphor. It is produced by a crude process of distillation, billets of the wood being boiled in water in large containers covered with straw, luted with clay. These containers or retorts generally hold about four hundred pounds of wood, which is renewed every day for about ten days. At the end of this time the crystals of camphor are found adhering to the straw upon which it has been deposited. It reaches the markets in an impure and moist condition in lead-lined chests each containing about one hundred and fifty pounds. The moist nature is due to the addition of water which is used to prevent volatilization.

JAPANESE OR DUTCH CAMPHOR.

Japanese camphor reaches the market by way of Batavia, and is therefore often called Dutch camphor. It is usually of larger grain, is pinkish in color and of superior quality than the Chinese product and is received dry. It is packed in tubs containing about one hundred and twenty-five pounds and is sometimes also known as tub camphor. Wooden condensers and bamboo tubes are used in the process of production.

REFINING.

The process of refining camphor was long kept secret and for a time the city of Venice maintained a monopoly of the art. The method is termed "sublimation" and its object is to free the crude product from impurities. It bears the same relation to the refining of solids as distillation does to the manufacture of liquids. The process is now well known and it has been carried on successfully in many large cities, although as has been said, the difficulty in securing the crude material has practically forced American and European refineries from the field. Briefly the method is conducted as follows:

The camphor is first broken into small pieces, and about three per cent. of slaked lime and two per cent. of iron filings being added, it is placed in glass flasks imbedded in sand. These are then gently heated to about 190 degrees C. for an hour to expel moisture and then to about 204 degrees C., at which temperature it is maintained for twenty-four hours. The flasks are now corked and the sand is removed from the upper portion, where the cam-

phor condenses in pure white crystals. If air is permitted to enter the flasks during this process, the camphor becomes opaque in appearance and consequently less attractive. The flasks are finally sprinkled with water and being broken, the camphor is removed from the upper shoulder where it has collected. Each flask produces a circular cake or bell about twelve inches across, and some three inches thick, weighing about ten pounds. The object of this process is to retain the temperature just below the degree of volatilization. The lime is used in order to free the camphor from any resin which may be present and the iron in the same way takes up whatever sulphur there may be. Charcoal is frequently also employed to remove any foreign coloring matter.

RESUBLIMATION.

In former times the camphor was in Europe subjected to a further operation termed "resublimation." This process was not only useless from a practical point of view, but pernicious to the consumer, as its object was to introduce to the mass about fifteen per cent. of interstitial water in order to increase its bulk. The peculiar property of thus absorbing moisture was long made use of and only abandoned with reluctance, as the device well repaid the cost of operation.

CULTIVATION.

The cultivation of the camphor tree is attracting considerable attention in Ceylon, where it is found to flourish at altitudes, from sea level to five thousand feet and upwards. The old, destructive method of obtaining the camphor is now being abandoned as too improvident to repay the expenses of cultivation. The distillation of camphor direct from the wood is, however, still practiced, but planters are commencing to experiment in other and less wasteful processes. In this respect the analogy between the causes affecting rubber and camphor industries, already alluded to, has another parallel, for whereas with the best variety of rubber—the Para—the knowledge of a satisfactory process of obtaining the lac is still in abeyance and depends upon experiment, the same experimental period is being undergone to discover the most economical production of camphor. There seems to be a general tendency to look towards the leaves and new twigs as to the future source of commercial camphor. It is found that the valuable product is distributed throughout the whole system of the tree, and a method of cultivation, depending upon the production of a large quantity of leaves and twigs, is probably the one which will be aimed at.

ESTIMATED YIELD.

To effect this it is proposed in Ceylon to plant the trees in rows,

about eight feet apart and running across the direction of the prevailing winds—about two to three feet being allowed to each tree. By a system of rigorous pruning the trees would be kept from becoming tall, thus diminishing the cost of labor, and would be induced by constant clipping, to yield a maximum foliage. Experiments conducted on a small scale have shown that trees planted twelve feet apart yield nearly fifty pounds of clippings per tree. As the process may be repeated four times a year about 50,000 pounds of green clipping would be the annual yield per acre. The yield of camphor from fresh leaves is variously estimated at from $1\frac{1}{2}$ to 2 per cent. and of the twigs at a little more than 2 per cent. Taking the production of the two sources combined at only $1\frac{1}{2}$ per cent., the annual crop of camphor per acre would be about 750 pounds. This under the system suggested of closely planted hedges should with care be increased to about one thousand pounds per acre.

The present price of camphor is about 65 cents per pound, but basing our estimate at 50 cents and the annual yield at 750 pounds, the gross return per acre would be about \$375. It is estimated that the cost of planting, weeding, distillation and fuel would amount to \$75, giving a net return per acre of \$300. As the uses of this article are greatly increasing, and the supply tending to diminish, the profit per acre would probably be greater than the above estimate upon large plantations, as soon as the most weighty economical problems of the industry have been solved. However taking the moderate price of our estimate, adding one-third more for labor and reducing the anticipated harvest by a like amount a net income of \$150 per acre should be secured. On a small plantation of six acres—a venture probably within the reach of almost every one here present—an income of nearly one thousand dollars per annum should be secured in about four years.

COST OF PLANTING.

The present price in Japan of young camphor trees, about a foot and a half high, is \$100 per thousand. Good results, however, may be obtained from seed, which ripens in Japan in October and November. The seed generally does not preserve its vitality unimpaired for a length of time and before planting, it should first be soaked in water for twenty-four hours or upwards. The best seed will be found to sink to the bottom. In planting the seed a well fertilized sandy loam is preferred. Upon this it is sprinkled and covered with sifted earth for about half an inch. About two thousand plants may be obtained from one pound of seed. To conserve moisture and protect the young plants from the sun when they first appear, straw should be strewn upon the bed and a few stakes inserted in the ground to prevent it from blowing away. The trees should be transplanted 6 inches apart and when about 12 inches high should be set out permanently. Clipping may be

commenced at three years. At five years old, if not pruned, the trees attain a height of about twenty feet and a spread of about ten feet.

The cultivation of camphor is now engaging the attention of the Secretary of Agriculture. There is little doubt that the next ten years will see this industry well established on a profitable basis in many countries. At present great difficulty is experienced in procuring seed, as the Japanese are guarding the industry very jealously. It is said, however, that the plant grows well from cuttings, and as there are a few trees already established in Hawaii, and generally thriving well, there may be a possibility of procuring sufficient seeds and cuttings locally. The whole question of the successful cultivation of camphor has yet to be answered, but to anyone possessing land in Hawaii not suited to rubber, tobacco, sisal or citrus fruits, or holding more land than they care to put under the above crops, my advice is emphatically, to experiment in camphor.

NEW PUBLICATIONS.

FARMERS' BULLETINS.

The following recent Farmers' Bulletins may be obtained free from the Secretary of Agriculture, Washington, D. C.:

Bulletin 276. Experiment Station Work. XXXIX. Pp. 32, figs. 2. Contents: Improvements in peach growing—Mulberries—Alfalfa in the Eastern States—Oat culture in the South—Improvement of grass land—Succotash as a soiling crop—Tankage and bone meal for hogs—Grinding corn for hogs—Dips as lice killers—Digestibility of fish and poultry—Honey vinegar—The farm wood lot.

Bulletin 277. The Use of Alcohol and Gasoline in Farm Engines. By Charles Edward Lucke, Assistant Professor of Mechanical Engineering, Columbia University, and S. M. Woodward, Irrigation Engineer, Office of Experiment Stations. Pp. 40, figs. 12. This Bulletin deals with the cost and thermal efficiency of different fuels; the need of power for pumping purposes in irrigated districts; the use of gasoline engines on irrigated farms, and their adaptability to the use of alcohol, with a report of practical experience with alcohol engines in Germany.

Bulletin 278. Leguminous Crops for Green Manuring. By C. V. Piper, Agrostologist in Charge of Forage Crop Investigations, Bureau of Plant Industry. Pp. 29, figs. 14.

Bulletin 280. A Profitable Tenant Dairy Farm. By Lyman Carrier, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 16, figs. 3.

Bulletin 288. The Nonsaccharine Sorghums. By C. W. Warburton, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 30, figs. 9.

Bulletin 282. Celery. By W. R. Beattie, Assistant Horticulturist, Bureau of Plant Industry. Pp. 38, figs. 16. This Bulletin gives the botany and climatic and soil requirements of the celery plant, directions for its cultivation, storage, and marketing, with a description of its insect enemies and methods for their control. It is designed to supersede Farmers' Bulletin 148, on the same subject.

Bulletin 289. Beans. By L. C. Corbett, Horticulturist, in Charge of the Arlington Experimental Farm, Bureau of Plant Industry. Pp. 30, figs. 12. Kinds of beans and their respective merits, cultural operations, harvesting, cleaning, and grading are detailed. Growing on a commercial scale and in the garden are both treated.

Bulletin 291. Evaporation of Apples. By H. P. Gould, Assistant Pomologist, Bureau of Plant Industry. Pp. 40, figs. 16. A timely account of methods of drying fruit by artificial heat. The kinds of evaporators, with their advantages, special appliances for handling, and methods of preparing and handling fruit, are set forth. Grading, packing, storing, prices, and laws on evaporated fruits are also discussed.

Bulletin 292. Cost of Filling Silos. By Lyman Carrier, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 15, figs. 3. This brief account, with accompanying tables, supplies full and valuable information on a subject which is growing in interest with the increased use of silos.

Bulletin 293. Use of Fruit as Food. By C. F. Langworthy, in Charge of Nutrition Investigations, Office of Experiment Stations. Pp. 40, fig. 1. A revision and extension of an article published in the Department Yearbook of 1905. Composition and digestibility of fruit, with the effect of ripening on composition, are leading features. Ways of cooking and serving, with directions for handling, marketing, and storing, are also given.

IRRIGATION AND DRAINAGE INVESTIGATIONS.

Bulletin 183. Mechanical Tests of Pumping Plants Used for Rice Irrigation in Louisiana and Texas, 1905 and 1906. This bulletin gives the details of a large number of mechanical tests of pumping plants used for rice irrigation in Louisiana and Texas. Most of these plants use crude oil for fuel, and they are therefore of special interest to those using this fuel. It also includes estimates of the cost of different types of plants and their cost of operation, showing that in most instances the high-class machinery is very little, if any, more expensive in first cost and very much cheaper in operation.

Application for this bulletin should be made to the Director of the Office of Experiment Stations, Washington, D. C.

THE USE OF THE NATIONAL FORESTS.

The above publication has recently been issued by the Department of Agriculture, and is a brief, clear manual for public information as to the forest policy of the National Government.

It is too true, as the short preface says, that "many people do not know what National Forests are. Others may have heard much about them, but have no idea of their true purpose and use." It is the object of this publication to explain just what the National Forests mean, what they are for, and how to use them.

In the first place, it is explained how the Forests are created and how their boundaries are drawn. Next, their direct use and value are shown from the point of view of the homeseeker, the prospector and miner, the user of timber, the user of the range, the user of water, and other users of Forest resources. Third, it is shown how the Forests are intended for use, for the production of usable products, and for the establishment and maintenance of homes; how on all of them the timber is protected from fire, the water flow is kept steady, the forage on the range is increased and guarded from abuse; and how, in addition, they serve as great public playgrounds and as breeding places and refuges for game. Finally, the management of the National Forests is described.

Here it is that the great usefulness of the Forests is brought out most clearly and strikingly; for the Forests are managed by the people in their own interests, and every means is used to meet the desires and wants of all Forest users half way by dealing with them in the main directly on the ground and in all cases with the utmost practicable dispatch and freedom from red tape.

In a word, the special interest of this manual lies in its showing that the Forest policy of the Government, both in principle and in practice, is for the benefit of the ordinary man, for the benefit of every citizen equally. There is still a tendency to think of the National Forests as "preserves" closed to use, and to leave the public lands exposed to unregulated individual exploitation. Where these misapprehensions still prevail "The Use of the National Forests" will go far to correct them.

The book is written by Mr. Frederick E. Olmsted, whose intimate knowledge of conditions in the West and the policy under which the National Forests are managed especially fits him to deal with the subject.

HAWAIIAN ENTOMOLOGICAL SOCIETY'S PROCEEDINGS.

Part 3 of Volume I of the proceedings of the above society has just been issued. It contains much valuable data, chiefly

on Hawaiian entomology. Copies of this publication may be obtained at 50 cents each, by application to the secretary or treasurer of the society, Honolulu.

CORRESPONDENCE.

Editor Forester: Would you kindly put me in communication with the right party, to supply me with eggs of pure White Leghorns and B. Plymouth Rocks, or better ask such a party to send me prices of above. I would also like to have price of trio of each of the above breeds—cockerel and two young pullets.

Respectfully,
CORRESPONDENT (Hawaii).

Answers to above, if directed care of Editor of Forester, Box 59, Honolulu, will be promptly forwarded to our correspondent.

We have received by the Alameda a letter from Dr. Cobb of the Bureau of Plant Industry, who is well known to our readers. In it he very kindly offers to furnish Hawaiian pineapple growers with any additional information they may desire arising from the publication of his article on pineapple diseases which appeared in the May Forester. He also adds: "I am most pleased to receive the Forester still. The news about the Regents for the Agricultural College was very interesting. I am gradually becoming settled in my new work, and shall, in time, I hope, be able to send you something in print that may interest you."

Forester readers desiring to correspond with Dr. Cobb, relative to the information he offers, should address their letters: Dr. Cobb, Crop Technology, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

FIFTEENTH NATIONAL IRRIGATION CONGRESS.

The fifteenth National Irrigation Congress will be held in Sacramento, California, September 2-7, inclusive, 1907. The four great objects of the Congress are to "save the forests, store the floods, reclaim the deserts and make homes on the land."

All who are interested in these achievements are invited to attend the Congress, and, by participating in its deliberations, contribute to a wise direction of national policies and to the development of practical methods of conserving and developing the great natural resources of the country, thereby insuring a greater stability of prosperous conditions, extending the habitable area, increasing the products of the land, and increasing internal trade and commerce.

Through the efforts of the past Irrigation Congress a fund of forty million dollars has been collected, which enormous amount is being expended in the construction of twenty-five great irrigation projects which will result in a cultivated area of not less than three million acres of crop-producing land.

National and State officials, irrigation and forestry experts, engineers, farmers and irrigators, manufacturers, professional and business men, industrial workers, editors and other representatives of the press will attend the Congress.

Simultaneously with the Irrigation Congress there will be held at Sacramento an Interstate Exposition of Irrigated Land Products and Forest Products. The exhibition of irrigated products will be the finest ever assembled anywhere in America.

The California State Fair will follow the Congress, opening on September 7th, when the joint closing and opening ceremonies will be attended by a great irrigation celebration, the day closing with a magnificent allegorical irrigation parade and electrical illumination.

California affords many opportunities for the study of irrigation, irrigation practices and results, irrigated crops of every kind and irrigation opportunities. Sacramento, the capital city of California, where the Congress will be held, is situated near the center of the great valley which extends lengthwise through the State a distance of nearly five hundred miles and comprises approximately ten million acres of fertile land. Colossal plans for the construction of storage dams, and distributing canals for the irrigation of this great plain are now being made by engineers of the Reclamation Service and money has been apportioned from the reclamation fund for the construction of an initial unit of the great system contemplated.

September is a season of fruits and grapes in California and visitors to the Congress will have opportunities at Sacramento and throughout the State of enjoying the best that California orchards and vineyards yield and of enjoying it fresh from tree and vine.

The program of the Congress will consist of addresses by men eminent in this and other countries, carefully prepared papers by administrative officials and engineers of the National Reclamation Service and Forest Service, with ample provision for volunteer speeches and discussion.

All delegates will be invited to visit San Francisco, where re-building operations are being carried forward on a scale so vast as to render that city today the greatest and most interesting exhibition of man's constructive genius, civic pride and commercial enterprise ever witnessed in the world.

RECENT LEGISLATION.

(Continued.)

ACT 23.

An Act to Amend Section 1409 of the Revised Laws of Hawaii, Relating to Licenses of Tobacco, Cigars and Cigarettes.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 1409 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 1409: Fee. The annual fee for a license to sell tobacco, leaf tobacco, cigars or cigarettes, shall be Ten Dollars.

A grower of tobacco shall not be required to pay and shall be exempt from paying the said annual fee of Ten Dollars for the sale by him of tobacco or leaf tobacco grown or produced by him or received by him as rent from tenants who have produced the same on his lands. Provided, that nothing in this Section shall be construed to exempt any grower of tobacco from the annual fee of Ten Dollars who by peddling, or otherwise, sells tobacco, or leaf tobacco, at retail directly to consumers."

Section 2. This Act shall take effect from the date of its approval.

Approved this 25th day of March, A. D. 1907.

G. R. CARTER,

Governor of the Territory of Hawaii.

ACT 77.

An Act Amending Section 1223 of the Revised Laws of Hawaii Relating to the Exemption from Taxation of Property Used in Certain Industries.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. That Section 1223 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 1223. Property used in certain industries. For the five years from December 31, 1907, all property, real and personal, solely and actually used in the cultivation and production of sisal fibre, castor oil, copra, vanilla extract, Hawaiian starch, pineapples, arrowroot and manioca starch (Kasawa), shall be exempt from property taxes thereon: provided, however, that such exemption shall not apply to any land in excess of forty acres so used by any one person, firm or corporation in the cultivation and production of pineapples."

Section 2. This Act shall take effect from and after the date of its approval.

We hereby certify that the foregoing Bill, after reconsidera-

tion on the veto of the Governor, was, upon a vote taken by Ayes and Noes, approved by a two-thirds vote of all of the elective members of the Senate and House of Representatives of the Territory of Hawaii, on the 17th day of April, A. D. 1907.

E. F. BISHOP,
President of the Senate.

WILLIAM SAVIDGE,
Clerk of the Senate.

H. L. HOLSTEIN,
Speaker, House of Repre-
sentatives.

JNO. H. WISE,
Clerk, House of Repre-
sentatives.

DIVISION OF FORESTRY.

PROCLAMATION OF THE RESERVATION OF CERTAIN LANDS IN THE KOOLAU AND THE HANA FOREST RESERVES, ISLAND OF MAUI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, enacted February 27, 1905, as amended by Act 65 of the Session Laws of 1905, enacted April 26, 1905, and by Act 4 of the Session Laws of 1907, enacted March 5, 1907, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of Hawaii, having held the hearing, of which notice had been duly given, as in said acts provided, do hereby set apart as integral parts of the Koolau and the Hana Forest Reserves on the Island of Maui, subject to the existing leases, as provided by law, the government forest lands described below.

KOOLAU FOREST RESERVE.

In the Koolau (Maui) Forest Reserve, I do hereby set apart, as integral parts of that reserve, those portions of the tracts of government land (more particularly described below) known as Honomanu, Keanae Mauka, Wailua 1 and 2 Mauka, Wailua-Ulaine Forest and Hana Forest, which lie within the boundaries of the Koolau (Maui) Forest Reserve, the location and metes and bounds of which said reserve, situate in the Districts of Koolau and Hamakualoa, Island of Maui, are more particularly described by and on a map made by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 1268" and "Koolau Forest Reserve, Maui"; and a description accompanying the same, numbered C. S. F. 1630, which said description, now on file in the said Survey Department, as is follows:

Beginning at a point on the boundary line between the Districts of Hana and Koolau, where the mauka boundary of the Nahiku homesteads if projected easterly would intersect the said District line, the boundry runs:

1. In a general north-westerly direction to and along the mauka boundary of the Nahiku Government homesteads to the gulch between the lands of Kapaula and Puakea, or Paakea, said gulch being also named Waiaaka gulch on Public Lands Map No. 20 of Nahiku, about 22,000 feet in a direct line;

2. Thence makai, down said Waiaaka gulch to the Koolau Ditch, about 2,800 feet in a direct line;

3. Thence in a general westerly direction along the Koolau and Upper Hamakua Ditch trail to the western boundary of the land of Opana in the District of Hamakualoa, about 61,000 feet in a direct line;

4. Thence mauka along the westerly boundary of said Opana to the makai boundary of the land of Haiku-uka, belonging to the Haiku Sugar Company and Paia Plantation, about 20,000 feet in a direct line;

5. Thence, in a general westerly direction, along the makai boundary of the said Haiku-uka land of the Haiku Sugar Company and Paia Plantation, to the Maliko Gulch, near Pali o Ka Moa, about 2,000 feet in a direct line;

6. Thence south 34° east, true, 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakae;

7. Thence south $53^{\circ} 21'$ east, true, 42,980 feet, along the land of Kalialinui, crossing the Koolau Gap, to Pohaku Oki Aina;

8. Thence in a general easterly direction, along the northern crest of the Kipahulu Valley to a point where the boundary line between the Districts of Koolau and Hana intersects the Kipahulu Valley, about 10,000 feet in a direct line;

9. Thence in a general north-easterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point of beginning, about 21,500 feet in a direct line. The various distances in the above description are approximate only, being scaled from the map showing the reserve boundary.

Area, 42,969 acres, more or less.

The location and metes and bounds of each of the above named tracts are more particularly described by descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1630, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land of Honomanu, within the Koolau (Maui) Forest Reserve, and covered by Lease 52.

Beginning at Kikau, a hill at the southeast corner of the land of Honomanu and on the boundary of Koolau and Hamakualoa districts, and running:

1. In a northwesterly direction across Honomanu Valley and ravine and along Haiku, in Hamakualoa district, to eastern bank of stream in Napuamahoinui ravine, distance 7,035 feet;

2. Thence in a northeasterly direction along Koloa and along east side of stream in Napuamahoinui ravine to the Koolau Ditch Trail, distance about 13,200 feet;

3. Thence in a southeasterly direction along the Koolau Ditch Trail to the western brink of Nuaailua stream, direct distance about 8,000 feet; said Koolau Ditch Trail being the makai boundary of the Koolau (Maui) Forest Reserve;

4. Thence in a southwesterly direction along the western bank of the Nuaailua stream to the initial point, distance about 9,200 feet.

Area, 2,000 acres.

Compiled from Lease No. 52 and C. S. F. 1630.

Portions of Government lands known as Keanae Mauka, Wailua 1 and 2 Mauka, and Wailua-Ulano, within the Koolau (Maui) Forest Reserve, Koolau, Maui, and covered by Leases 538 and 539.

Beginning at Kikau, a hill at the southeast corner of the land of Honomanu and on the boundary of Koolau and Hamakualoa districts, and running:

1. In a northeasterly direction along the Nuaailua stream along the land of Honomanu to the Koolau Ditch Trail, distance about 7,500 feet;

2. Thence in a general easterly direction along the Koolau Ditch Trail to the western brink of the gulch between the lands of Kapaula and Puakea (or Paakea), said gulch being also named Waiaaka Gulch on.

Public Lands Map No. 20, the direct distance being about 23,000 feet; said Koolau Ditch Trail being the makai boundary of the Koolau (Maui) Forest Reserve;

3. Thence southwesterly along the western brink of the Waiiaaka gulch to Palaha, a point on the edge of the Crater of Haleakala, and at the junction of the districts of Koolau, Hamakualoa, Hamakuapoko, Honuaula, Kahikinui, Kaupo and Hana, direct distance about 30,400 feet;

4. Thence northwesterly along the land of Haiku, Hamakualoa district, to a hill on the western edge of the Keanae Valley, distance about 32,490 feet;

5. Thence northeasterly along the land of Haiku, Hamakualoa district, to the initial point, distance about 7,660 feet.

Areas—

In Keanae Mauka	8,750 acres
In Wailua 1 and 2 Mauka.....	1,280 acres
In Wailua-Ulaino	3,000 acres

Total area 13,030 acres

Compiled from Leases 538 and 539 and C. S. F. 1630.

Portion of Government land known as Hana Forest, Lease 492, (being more properly a portion of the Wailua - Ulaino Forest), and within the Koolau (Maui) Forest Reserve, Koolau, Maui.

Beginning at a point on the boundary line between Hana and Koolau districts where the mauka boundary of the Nahiku Homestead if projected easterly would intersect the said district line, and running:

1. In a northwesterly direction to and along the mauka boundary of the Nahiku Homesteads, distance about 3,300 feet; thence

2. S. 45° 30' W. true 3,900 feet, a little more or less, along Government land;

3. S. 11° 00' W. true 11,800 feet, a little more or less, to a point on dividing ridge between Hana and Koolau districts;

4. Thence northeasterly along boundary between said districts to the initial point, distance about 14,700 feet.

Area, 900 acres.

Compiled from C. S. F. Nos. 744 and 1630.

HANA FOREST RESERVE.

In the Hana Forest Reserve, I do hereby set apart, as integral parts of that reserve, those portions of the tracts of government land (more particularly described below) known as Hana Forest, Wakiu, Kawela-Kaeleku, East Honomaele and Koali-Puuhaoa, which lie within the boundaries of the Hana Forest Reserve, the location and metes and bounds of which said reserve, situate in the District of Hana, Island of Maui, are more particularly described by and on maps made by the Hawaiian Government Survey Department, which said maps are now on file in the said Survey Department, marked "Registered Maps Nos. 1268 and 1750" and "Hana Forest Reserve, Maui"; and a description accompanying the same, numbered C. S. F. 1690, which said description now on file in the said Survey Department, is as follows:

Beginning at Puu Hinai, a hill on the boundary of Hana and Koolau districts, and the southeast corner of the land of Ulaino, (L. C. A. 8515 B. to Kanehoa), and running as shown on Government Survey Registered Map No. 1750;

1. In a southeasterly direction across the lands of Makapuu (Government), West Honomaele (fee simple), East Honomaele, Kawela, Kaeleku (all Government), to a point on the shoulder of the hill called Olopawa, 1,000 feet northeast of the Government Survey Trig. Station "Olopawa";

2. Thence southeasterly across the Government lands of Honokalani,

Wakiu and Kawaipapa to a point on the pali of the Kawaipapa gulch at the northwest corner of Grant 3154 to Kahoomakaulii;

3. Thence along the following grants: 3154 to Kahoomakaulii, 3193 to C. Kakani et al., 883 to G. P. Judd, and L. C. A. 443 to Richardson, to the southwest corner of L. C. A. 443 to Richardson;

4. Thence southerly across the fee simple lands of Aleamai (L. C. A. 8660 to Kukamauna no Kaleimakalii) and Haneoo (L. C. A. 8525 B. to Kauwa) to the northwest corner of Grant 2879 to John Rae;

5. Thence across said grant to its southwest corner;

6. Thence across Government land to Kakio to a point on the northern boundary of Government land of Waiohonu;

7. Thence southwesterly across Waiohonu to a point on its south boundary, where the line makes an angle;

8. Thence across Government lands of Puuiki-Papahawahawa to a point on the northeast boundary of Muolea (L. C. A. 8452 to Keohokalole) where said boundary turns almost due east;

9. Thence across Muolea (L. C. A. 8452 to Keohokalole) to the northwest corner of Grant 382 to E. Whittlesey;

10. Thence along mauka boundary of Grant 382 to E. Whittlesey;

11. Thence across Government land of Wailua to northwest corner of Grant 1165 to C. A. Bouillon;

12. Thence along mauka boundary of Grant 1165 to C. A. Bouillon to said grant's southwest corner;

13. Thence across Government lands of Paehala and Puaaluu to the boundary between the districts of Hana and Kipahulu;

14. Thence following up said district boundary until it intersects with the boundaries of Koolau, Hamakualoa, Wailuku, Honuaula, Kahikinui and Kaupo districts at the large rock on the northeast brink of the crater of Haleakala, called Palaha;

15. Thence down Hana-Koolau boundary to initial point.

Approximate area, 14,825 acres.

The location and metes and bounds of each of the above named tracts are more particularly described by descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1690, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land known as Hana Forest, Lease 492, and within the Hana Forest Reserve, Hana, Maui.

Beginning at Government Survey Trig. Station "Olopawa," thence running:

1. N. 57° 30' W. true 10,700 feet to top of Puu Hinai;

2. Thence southwesterly along boundary between Koolau and Hana districts to point on dividing ridge between said districts, distance about 19,000 feet;

3. Thence along said dividing ridge, general course and distance S. 76° 15' W. true 9,200 feet, to point on edge of great Kipahulu Valley, which point is distant 3,000 feet in a straight line from Government Survey Trig. Station at Wainapenape; thence

4. N. 89° 30' E. true 27,500 feet, a little more or less, to top of hill;

5. N. 55° 30' E. true 2,500 feet, a little more or less, to top of hill Koaikea;

6. Thence along boundaries of Aleamai (L. C. A. 8660), Oloewa (L. C. A. 443), Grant 883 (G. P. Judd), Grant 3193 (Kakani, et al.), and Grant 3154 (Kahoomakaulii) to north angle of last named grant; thence

7. N. 61° 30' E. true 5,800 feet, a little more or less, to the initial point.

Area, 6,330 acres.

Compiled from C. S. F. Nos. 744 and 1690.

Portions of Government lands of Wakiu, Kawela-Kaeleku and East Honomale, within the Hana Forest Reserve, and covered by Leases 518 and 474, Hana, Maui.

Beginning at Government Survey Trig. Station "Olopawa" and running:

1. N. 62° 00' W. true 6,500 feet to gulch, the boundary between East and West Honomalee;

2. Thence northeasterly along said gulch to its intersection with the makai line of the Hana Forest Reserve, distance about 380 feet;

3. Thence along makai line of said Hana Forest Reserve in a southeasterly direction across the lands of E. Honomalee and Kawela-Kaeleku to a point on the shoulder of the hill called Olopawa, 1,000 feet northeast of the Government Survey Trig. Station "Olopawa," distance about 6,900 feet;

4. Thence still along the makai line of the Hana Forest Reserve in a southeasterly direction across the lands of Honokalani and Wakiu to the intersection of this line with the line of Wakiu Lease No. 518, distance about 860 feet; thence

5. Due west 1,400 feet, a little more or less, to the initial point.

Areas—

In Wakiu	3 acres
In Kawela-Kaeleku	65 acres
In E. Honomalee	15 acres

Total area 83 acres

Compiled from C. S. F. Nos. 224, 300 and 1690.

Government remainder of Koali-Puuhaoa in Hana Forest Reserve, Hana, Maui, and covered by Lease 479 B.

Beginning at southwest corner of Grant 1165 to Bouillon, thence running:

1. Northwesterly in a straight line to summit of high peak "Kaumakani";

2. Thence following down dividing ridge from this point to summit of conical hill "Hoolio" at head of land of Muolea;

3. Thence southeasterly along boundary of Muolea to the north angle of Grant 382 (Whittlesey);

4. Thence southwest along mauka boundary of this Grant 382 to the boundary of Crown land of Wailua;

5. Thence running mauka and around said land of Wailua and makai and along boundary of Puuhaoa and Wailua to north angle of Grant 1165 (Bouillon);

6. Thence southwest across head of last named grant to initial point. Area 600 acres, more or less.

Copied from C. S. F. No. 583.

In Witness Whereof, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive building, in Honolulu, this 12th day of June, A. D. 1907.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICTS OF NA PALI, KONA AND HALELEA, ISLAND OF KAUAI.

NA PALI-KONA FOREST RESERVE.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, enacted February 27, 1905, as amended by Act 65 of the Session Laws of 1905, enacted April 26, 1905, and by Act 4 of the Session Laws of 1907, enacted March 5, 1907, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of Hawaii, having held the hearing, of which notice had been duly given, as in said acts provided, do hereby approve as a Forest Re-

serve, to be called the "Na Pali-Kona Forest Reserve," those certain pieces of land in the Districts of Na Pali, Kona and Halelea, Island of Kauai, lying on the Waimea Upland, bounded on the south and west by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons, on the northwest by the palis of Na Pali District, on the north and east by the Districts of Halelea and Puna, and on the southeast by the land of Wahiawa, containing an approximate area of 60,540 acres, in the Districts of Na Pali, Kona and Halelea, Island of Kauai, Territory of Hawaii, more particularly described by and on maps made in December, 1906, by the Hawaiian Government Survey Department, which maps are now on file in the said Survey Department, marked "Registered Maps 2246 and 2375" and "Na Pali-Kona Forest Reserve, Kauai"; and a description accompanying the same, numbered C. S. F. 1757, which said description now on file in said Survey Department, is as follows:

NA PALI-KONA FOREST RESERVE. |

Including the greater part of the District of Na Pali, a portion of the ahupuaa of Haena in the District of Halelea, and portions of the ahupuaas of Hanapepe, Makaweli and Waimea, in the District of Kona, Island of Kauai.

Beginning at Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898, as shown on Government Survey Registered Maps Nos. 2246 and 2375, and running as follows:

1. In a general westerly direction following along down the Kauhao paddock fence, distance about 11,160 feet, to a point on said fence at the edge of the pali;

2. Thence northerly across the Kauhao and Makaha ridges to "Makaha" Trig. Station, from which the true azimuth and distance to "Hanalei" Trig. Station is $2^{\circ} 22' 10''$, 18,781.5 feet;

3. Thence northerly across the Makaha Valley and the Milolii Ridge to the head of the waterfall in Paaiki Valley;

4. Thence around the palis of the Milolii Valley to Anaki Peak, a prominent point on the edge of the pali;

5. Thence directly west down the pali to the foot of same;

6. Thence in a general northeasterly direction following the foot of the main palis around the valleys in the lands of Milolii and Nualolo and in the district of Na Pali to a point on the boundary between Na Pali and Halelea districts, said valleys being named as follows: Kaahole, Nualolo, Avaawapuhi, Honopu, Kalalau, Pohakuao, Waiolaa, Hanakoa, Wailaa, Waiahuakua, Waiahuakanaka, and Hanakapiai.

7. Thence easterly across the land of Haena in the district of Halelea, to a peak called Makana; thence to a peak called Pohakuakane; thence to a peak called Puunopili on the boundary between Haena and Wainiha. Excepting from this Reserve such parts of the valley of Haena and Manoa as the owners may see fit to retain for their own use.

8. Thence in a southerly direction along the main ridge dividing the lands of Haena and Wainiha to a point in said ridge on the makai boundary of the Halelea Forest Reserve, said point being 2,000 feet, more or less, makai of a prominent ridge running down into Wainiha Valley;

9. Thence in a southerly direction along the main ridge dividing the lands of Haena and Wainiha, being also the boundary of the Halelea Forest Reserve, to a point near Kilohana at the junction of the boundaries of the districts of Kona, Na Pali and Halelea;

10. Thence in a southeasterly direction along the main ridge dividing the Kona and Halelea districts to Mt. Waialeale, the junction of the boundaries of the districts of Kona, Halelea and Puna.

11. Thence in a southerly direction along the main ridge dividing

the Kona and Puna districts to a point called Kapalaoa on the boundary between Hanapepe and Wahiawa.

12. Thence in a southerly direction down the ridge dividing Koula (an ili of Hanapepe) and Wahiawa to a peak called Puu Aukai or Puuau, being near the end of the McBryde fence;

13. Thence in a northwesterly direction across the Koula and Manuahi Valleys to Peapea Peak on the boundary between Hanapepe and Makaweli;

Excepting from this Reserve such parts of the valleys of Koula and Manuahi as the owners may see fit to retain for their own use.

14. Thence in a northwesterly direction across the land of Makaweli across Kawaipapa and Kawaiu Valleys to Kaupuaa Peak;

15. Thence in a northwesterly direction across the Olokele, Kahana and Mokuone Valleys to the Oopulele Falls;

16. Thence in a northwesterly direction to a saddle in a ridge just mauka of Kaanakeakua;

17. Thence in a northwesterly direction across the head of Kaluaoakalani Valley over the Nakanakalolo Ridge to the falls in the Kahekapoelele Valley.

18. Thence following around the cliffs of Kalaukea Ridge to the Hihinui Falls in Opaewela Valley;

19. Thence in a northwesterly direction up to Kalehua-hakihaki on Kapukapaia Ridge, the boundary between Makaweli and Waimea, the true azimuth and distance from this point to "Puu Ka Pele" Trig. Station being: $109^{\circ} 12' 10''$, 21,831.7 feet;

Excepting from this Reserve such parts of the valleys of Olokele and Kahana as the owners may see fit to retain for their own use.

20. Thence in a northwesterly direction across Nawaimaka Valley to Kaaha Peak;

21. Thence in a northwesterly direction across Waialae Valley passing below the Kahumanono Falls to a prominent point on the Kaluahaulu Ridge above the head of the Oneopaewa Valley;

22. Thence in a northwesterly direction across Koaie Valley to Kahililoa Peak, the true azimuth and distance to "Puu Ka Pele" Trig. Station being: $69^{\circ} 38' 10''$, 8,266.0 feet;

Excepting from this Reserve that portion of the Koaie Valley below the foot of the cliffs and lying makai of the mouth of the Kipalau Valley, area 530 acres, more or less.

23. Thence in a northerly direction to the Awini Falls;

24. Thence in a northwesterly direction to a point known as Kaou on the Kumuwela Ridge, the true azimuth and distance to "Puu Ka Pele" Trig. Station being: $23^{\circ} 11' 10''$, 8,665.1 feet;

25. Thence in a northwesterly direction to the head of the Waipoo Falls;

26. Thence in a northwesterly direction to the junction of the Halemanu and Nawaimaka Valleys.

27. Thence in a southwesterly direction to the point of beginning.

In Hanapepe (Ilis of Koula and Manuahi).....	9,360 acres
In Makaweli	10,030 acres
In Waimea (Government land)	30,180 acres
In Na Pali (Government land).....	10,470 acres
In Haena	500 acres

Total area60,540 acres

And subject to the existing leases, as provided by law, I do hereby set apart as integral parts of the Na Pali - Kona Forest reserve those portions of the government lands (more particularly described below) known as Waimea, Miloli, Na Pali (of which the unleased part is now actually and definitely set apart) and Hanakapiai that lie within the metes and bounds of the above described Na Pali - Kona Forest Reserve.

The location and metes and bounds of each of the above named tracts of Government land, so set apart, more particularly appear in descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1757, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land of Waimea, District of Kona, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 112.

Beginning at Kalehua-hakihaki on Kapuakapaia Ridge, the boundary between Makaweli and Waimea, the true azimuth and distance from this point to "Puu Ka Pele" Trig. Station being $109^{\circ} 12' 10''$, 21,831.7 feet, and running:

1. In a northwesterly direction across Nawaimaka Valley to Kaaha Peak;

2. Thence in a northwesterly direction across Waialae Valley passing below Kahumanono Falls to a prominent point on the Kaluahaulu Ridge above the head of the Oneopaewa Valley;

3. Thence in a northwesterly direction across Koaie Valley to Kahililoa Peak, the true azimuth and distance to "Puu Ka Pele" Trig. Station being $69^{\circ} 38' 10''$, 8,266.0 feet;

4. Thence in a northerly direction to the Awini Falls;

5. Thence in a northwesterly direction to a point known as Kaou on the Kumuwela Ridge, the true azimuth and distance to "Puu Ka Pele" Trig. Station being $23^{\circ} 11' 10''$, 8,665.1 feet;

6. Thence in a northwesterly direction to the head of the Waipoo Falls;

7. Thence in a northwesterly direction to the junction of the Halemanu and Nawaimaka Valleys;

8. Thence in a southwesterly direction to Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898;

9. Thence in a northeasterly direction along the edge of the pali overlooking the Halemanu Valley to Pohakuwaawaa, a hill on the ridge bounding the districts of Kona and Na Pali.

10. Thence in a northeasterly direction along said ridge to Pihea, a prominent peak in the ridge;

11. Thence in a southeasterly direction still along said ridge to a point near Kilohana at the junction of the boundaries of the districts of Kona, Na Pali and Halelea;

12. Thence in a southeasterly direction along the main ridge dividing the Kona and Halelea districts to Kaoki, a prominent peak in said ridge;

13. Thence in a southwesterly direction along the Kapukapaia Ridge, the boundary between Waimea and Makaweli, to the initial point.

Excepting from this Reserve that portion of the Koaie Valley below the foot of the cliffs and lying makai of the mouth of the Kipalau Valley, area 530 acres, more or less.

Area, 24,372 acres.

Portion of the Government Ili of Milolii, in the ahupuaa of Waimea, District of Kona, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 164.

Beginning at Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898, and running:

1. In a general westerly direction following along down the Kauhao paddock fence, distance about 11,160 feet, to point on said fence at the edge of the pali;

2. Thence northerly across the Kauhao and Makaha Ridges to "Makaha" Trig. Station, from which the true azimuth and distance to "Hanalei" Trig. Station is $2^{\circ} 22' 10''$, 18,781.5 feet;

3. Thence northerly across the Makaha Valley and the Milolii Ridge to the head of the waterfall in Paaiki Valley;

4. Thence around the palis of the Milolii Valley to Anaki Peak, a prominent point on the edge of the pali;

5. Thence directly west down the pali to the foot of same;

6. Thence in a general northeasterly direction following the foot of the main pali around the valleys of Keahole and Nualolo in the land of Milolii to a point on the boundary between the Kona and the Na Pali districts;

7. Thence in a southeasterly direction along the ridge dividing the Kona and Na Pali districts to Pohakuwaawaa, a prominent peak in said ridge;

8. Thence in a southwesterly direction along the edge of the pali overlooking the Halemanu Valley to the initial point.

Area, 5,808 acres.

Portion of Government land in the district of Na Pali, within the Na Pali - Kona Forest Reserve, Kauai, not covered by lease.

Part I. Beginning at Pihea, a prominent peak on the main ridge bounding the districts of Kona and Na Pali, and running:

1. In a southwesterly direction along said main ridge to Pohakuwaawaa, a prominent peak in said ridge;

2. Thence in a northwesterly direction along said ridge to the foot of the main pali;

3. Thence in a general northeasterly direction following the foot of the main palis around the valleys in this section to a point on the northeast boundary of the land of Kalalau, said valleys being named as follows: Awaawapuhi, Honopu and Kalalau;

4. Thence in a southeasterly direction along the northeast boundary of Kalalau, along Lease 453, to the initial point.

Part II. All that portion of the district of Na Pali lying between the northeast boundary of the ahupuaa of Hanakapiai, Lease 345, and the southwest boundary of the ahupuaa of Haena, and bounded on the southeast by the main ridge dividing Haena and Wainiha and on the northwest by the foot of the main pali running along the coast of Na Pali.

Area of the two parts, 3,980 acres.

Portion of Government land in Na Pali within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 453.

Beginning at Pihea, a prominent peak on the main ridge bounding the districts of Na Pali and Kona, and running:

1. In a northwesterly direction down the ridge along the northeast boundary of the land of Kalalau to the foot of the main pali;

2. Thence in a general northeasterly direction following the foot of the main palis around the valleys in this section to a point on the southwest boundary of the land of Hanakapiai, said valleys being named as follows: Pohakuao, Waiolaa, Hanakoa, Waiolaa, Waiahuakua, Waiahuakanaka;

3. Thence in a southeasterly direction along the ridge bounding the land of Hanakapiai to a point near Kilohana, at the junction of the districts of Kona, Na Pali and Halelea;

4. Thence in a northwesterly direction along the main ridge dividing the districts of Kona and Na Pali to the initial point.

Area, 6,360 acres.

That portion of the ahupuaa of Hanakapiai in the district of Na Pali, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 345, includes all of the land of Hanakapiai lying above and south of the foot of the main pali running along the coast of Na Pali, and contains an area of 130 acres, more or less.

In witness whereof, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive building, in Honolulu, this 12th day of June, A. D. 1907.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good. All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION.

BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

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Jacob Kotinsky, *Assistant Entomologist.*
G. A. Jordan, *Inspector's Assistant.*
B. M. Newell, *Fruit and Plant Inspector at Hilo, Hawaii.*
Robert R. Elgin, *Fruit and Plant Inspector (Honorary) at Hilo, Hawaii.*
W. O. Aiken, *Fruit and Plant Inspector (Honorary) at Kahului, Maui.*
W. D. McBryde, *Fruit and Plant Inspector (Honorary) at Koloa, Kauai.*

DIVISION OF ANIMAL INDUSTRY.

Victor A. Nörsgaard, *Superintendent and Territorial Veterinarian.*
J. Charlton Fitzgerald, *Assistant Territorial Veterinarian.*

CLERKS AND STENOGRAPHERS.

Miss Melika Peterson.
Miss Ella K. Dayton.

NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

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REPORT ON THE GERMINATION OF THE SEEDS OF RUBBER PRODUCING PLANT.

By N. A. COBB.

Recently a number of instances of failure in the germination of rubber seeds have been called to my attention. These failures occurred in connection with plantations in various parts of the Islands. In some cases the seed was derived from foreign sources, in others the seed was grown in Hawaii.

In one case seed obtained from Brazil gave germination results at 33 per cent. The seed appeared to be sound when opening and examining the cotyledons. These latter were white and were not in the least discolored. When the seeds were filed and placed in germination chambers, it swelled and for the most part appeared to make a proper start, that is, the point of the plumule appeared at the end of the seed. Soon, however, the plumule and the ends of the cotyledons next to it acquired a yellowish color and later on a fungus appeared, described by the manager as a mildew. At the time these seeds were received at my laboratory, a whitish color was apparent on the outside of the seed where it had been filed and covering most of the germination end of the seed. An examination of this mycelium showed that it had not yet formed spores. On being placed in the Petri dish with moist, sterilized blotting paper, the fungus fructified and proved to be *Mucor mucedo*, one of the most common moulds. This would indicate that the trouble was not one inherent in the seed, but one that had been introduced by the treatment. In moist conditions the seed may have been subjected to what would tend to bring about infestation by this almost omnipresent fungus. It may be that if the seeds were filed less it would be better as I observed that it is for the most part on the disclosed cotyledon that the fungus starts. If the *mucor* alone is to be blamed, then the difficulty is one that can be overcome by the observation of sterile conditions. Horse manure is particularly liable to growths of *Mucor mucedo*. When placed in a moist, warm place, horse manure almost always gives rise to a rich growth of this fungus.

From the appearance of the seed I suspected that it might have been derived in such a way as to have been subject to moist conditions or might possibly have been subjected to moist conditions in transit: I would suggest that rubber seed may be treated as an experiment with Bordeaux mixture preparatory to placing in the seed-bed, or with solution of formaldehyde. All the conditions concerning the process of germination should be sterile as far as possible, that is, the seed should be sterilized, the seed-bed should be sterilized, the files should be sterilized, the hands of the operators should be disinfected and the bags under the seed separating it from the horse manure used to assist in the germination should be soaked in Bordeaux mixture. Possibly artificial heat would be preferable to that obtained by the use of manure. Ordinary chicken incubators might, perhaps, be tried. The boxes used in the seed-bed should be sterilized with plenty of hot water. The soil in which the seeds are to become established, after starting to germinate, should also be sterilized. This may be accomplished by bringing the soil to the boiling heat in large kettles. Mix the soil with sufficient water to produce thin mud and bring it to a boil. Afterwards dry the mud in the sun.

LOCAL SEED.

In one instance where local seed was being tried a large percentage of the seed failed to germinate. This was brought about by the attacks of small earth worms in the soil in which the seeds were planted. The sterile conditions indicated above would prevent the attacks of these worms at least during the very early stages of the plant's existence.

All the worms of this class are sensitive to dryness. They are found only where the conditions are moist. Under such conditions, they are known to seriously injure crops of various kinds and they sometimes exist in the soil in phenomenal numbers, as many as 25,000 to 50,000 of them being found on one square yard of ground. Though they feed, for the most part, on decaying organic matter, some of them attack the soft underground parts of living plants, such as the rootlets, soft and succulent roots and underground portions of the stem. It is evident that germinating seeds would be particularly attractive to such species as attack living plants. I have had some experience with these worms in Australia and have found that they can be fought best by taking advantage of the weather. Such soils as contain these worms in injurious numbers should be worked actively during the dry weather. All the stages of the worms are injuriously affected by dryness. The adult worms and the egg-cocoons of the young worms all quickly die as soon as they are deprived of

moisture. This precaution is one that does not involve additional expense, at any rate in many cases; in fact, the treatment pays for itself, as the additional tillage is often precisely what the soil needs to make it more fertile.

I have also observed that these worms find the odor of tar to be objectionable and that tarring the seed will, to a certain extent, drive them away, more especially if there is something else in the soil upon which they can feed. I do not know whether rubber seed will be injured by tarring, but would suggest that it be tried. If, at the same time, some cheap seed could be planted alongside, not tarred, the worms would probably attack the shoots of these seeds. Almost any cheap seed that produces edible crops would answer the purpose; for example, wheat.

These worms sometimes cause serious trouble in green houses, where the amount of soil being used is not great. Under such circumstances it is possible to sterilize the soil by using steam or hot water.

If tobacco waste is boiled in water, two or three pounds of waste to the gallon of water, a liquor is produced which is fatal to many small organisms, among them these worms. I do not think that such a decoction would injure rubber seeds, but I have never tried it and can only suggest that this may be a suitable means of fighting the worms in the present case.

It would be best to avoid stable manure where these worms are abundant. It would be better to use artificial manure should any manure be required.

Of course the drainage should be attended to and good drainage provided. In preparing buds for seedlings, sometimes earth is brought from some supposed fertile spot and these worms may be introduced in this way.

Lime water is said to be injurious to these worms, but I have never tried it.

Those who are engaged in introducing rubber into these Islands, have at the present the opportunity which they will never again have. Where the plants are being introduced to new areas, it is possible, by taking certain precautions, precautions that are not expensive, to prevent or at least delay the introduction of the pests of the crop. If no precautions are taken, these pests are sure to make their appearance and to attain at no distant date whatever virulence they may have in their native country or they may even exceed that virulence. Once they have obtained such a footing, the present opportunity will be gone. It seems to me that there is no money that can be spent in connection with introducing a new crop to these Islands that is so well spent as in taking great care at the outset that no preventable diseases are introduced. The money spent so as to accomplish this end will be returned in the near future, perhaps a thousand fold.

AN IMPRESSION OF THE GOVERNMENT NURSERY.

In the February issue of *The Plant World*, a botanic magazine published at Denver, Colorado, Dr. Pehr Olsson-Seffer opened a series of articles entitled "Visits to Some Botanic Gardens Abroad" with the following paragraphs in regard to the Government Nursery, at Honolulu. Dr. Olsson-Seffer's account of his visit to Honolulu is reproduced here as being of interest to the readers of this magazine:

HONOLULU. Who ever heard of a botanic garden in Honolulu? There is no garden with that name, it is true, but so far as that goes, the entire city of Honolulu can be considered a botanic garden, and it will easily stand comparison with many in attempt at a botanical garden, with only the name to entitle it to such a rank.

The government nursery at the corner of King and Keeaumoku streets is a good nucleus to a botanic garden. A number of trees, indigenous and exotic, are planted here, every tree is labeled, and altogether it is a creditable little arboretum. In one corner of the block is the building of the Territorial Board of Commissioners of Agriculture and Forestry, in which are the offices of the divisions of forestry, entomology and animal industry, as well as an excellent little library of reference books on botany and forestry, with the current periodicals of these sciences.

The grounds are under the direction of Mr. Ralph S. Hosmer, the Superintendent of Forestry, formerly of U. S. Department of Agriculture.

I visited the grounds almost daily for several weeks, and inspected the nurseries with Mr. Hosmer and his assistant, Mr. David Haughs. There are in the grounds fine specimens of the native screw palm, or "Hala" (*Pandanus odoratissimus*), of *Sabal blackburniana*, a fan palm, of *Calophyllum calaba*, the calaba tree. *Nephelium litchi*, which produces the leechie or litchi fruit, a special favorite with the Chinese, but becoming more and more appreciated by Americans, is represented by a large specimen, and *Cinnamomum cassia*, the "Lignum vitae" of Southern China, grows equally well.

Everywhere in Honolulu the Royal Palm (*Oreodoxa regia*) is used in forming avenues, and gives a distinct character to the place. *Caryota urens*, *Areca rubra*, the Oil Palm (*Elaeis guineensis*), and *Thrinax argentea* are commonly cultivated plants here. The Royal Poinciana (*P. regia*), the Cassias (*C. fistula*, *C. grandis*, and *C. nodosa*), *Durantas*, *Caesalpinias* and the Pride of India (*Melia azedarach*), give color to the tropical green, while introduced Casuarinas, Eucalypts, and Grevilleas intermingle in the parks and on the planted hill-sides with the native Ohia Lehua (*Metrosideros polymorpha*), Koa (*Acacia koa*), and sundry other indigenous trees.

Along the seashore and in its immediate neighborhood are numerous groves of coconut palms, and in most gardens sundry tropical fruit trees, such as *Carica papaya*, *Mangifera indica*, and *Persca gratissima* are common. The "Night Blooming Cereus" covers many stone walls in the city, and when in bloom is a remarkable sight.

Hawaii is an Eldorado for the botanist who has never been in the tropics. It is within easy reach of the Pacific Coast, and there is no place better suited for a pleasant vacation than these islands with their almost tropical flora, where the climate is agreeable, the living comfortable, and traveling easy.

Four weeks spent in the islands in 1902, and four weeks in 1906, made me love "Hawaii nei," "Happy Hawaii," as the natives call their kingdom of the sea, with its fair skies and blue ocean, its bright flowers and its verdant green, its droning palms, and its ragged volcanoes, its drowsy tropical atmosphere, and its brilliant sunsets, surpassed by none in my experience but those of Samoa, the most beautiful islands of the Pacific.

BOARD OF AGRICULTURE AND FORESTRY. DIVISION OF FORESTRY.

ROUTINE REPORTS.

May 15, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the routine report of the Division of Forestry for the fortnight.

During this time I have been in Honolulu engaged with various routine duties in connection with work of the Division of Forestry and with preparations for contemplated trips to the other islands, having to do with forest reserve matters.

The Governor has set the date of the public hearing for the consideration of the proposed Na Pali-Kona Forest Reserve on Kauai as Monday, May 27th. At the same time there will be considered the recommendations of the Board regarding the increase in area of government lands actually set apart in the Hana and the Koolau Forest Reserves on Maui.

Mr. Haughs has completed a report and planting plan for a part of the land of Wahiawa within the Ewa Forest Reserve. This report was prepared at the request of the Wahiawa Water Company.

On Tuesday evening, May 14th, the library room of the Board was used for a meeting of the Hawaiian Poultry Association.

The work in the Nursery and at the Nuuanu Forest Station has gone on as usual during the fortnight.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

July 29, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report covering the routine work of the Division of Forestry from May 15, 1907, to date.

During this period my own time has been taken up as follows: From May 14 to May 25 I was on Maui, making a trip around the West Maui mountain, in company with Mr. S. M. Kanakanui of the Survey Office, establishing points on the boundary of the proposed forest reserve in that section. Mr. Kanakanui spent the greater part of June and part of July in locating and marking the points selected. As soon as the technical description is received from the surveyor a report on this project will be submitted to the Board.

On May 28 and 29, in company with Mr. H. M. von Holt, and Mr. O. L. Sorenson, of the Survey Office, I visited the land of Honouliuli on this island to fix the points on the proposed forest reserve on the Waianae Mountains where the boundary crosses this land. Mr. Sorenson later located these points. The matter will be reported on to the Board in the near future.

During the first part of June I was in Honolulu engaging with various routine matters incident to the Na Pali-Kona (Kauai) and Koolau (Maui) Forest Reserves, to the completion of a list of foreign seed exchanges, to matters connected with the close of the biennial fiscal period and with other details connected with the regular work of the Division.

From June 18 to July 3 I was on the Island of Hawaii engaged: (1) in an inspection of the work of the Hawaiian Mahogany Lumber Company, undertaken at the request of the Trustees of the Bishop Estate, under the offer of assistance contained in Circular No. 1 of this Division. This examination had been projected for some time and had more than once been unavoidably postponed. (2) In an examination of the land of Piihonua, made at the request of the Commissioner of Public Lands.

Since my return to Honolulu I have been engaged in the preparation of reports on various forest reserves and other projects

and with routine and other matters connected with the Division of Forestry.

On May 27 a public hearing was held to consider the creation of the Na Pali-Kona Forest Reserve on Kauai and the setting apart of additional government lands on the forest reserves on Maui. On June 12 Acting Governor Atkinson signed proclamations carrying these projects into effect.

At the Nursery considerable work has been done during the last two months toward bettering the condition of the grounds by curbing the walks and driveways and filling them with coral rock to conform to grade. When completed the grounds will be greatly improved. The larger part of the cost of these improvements is borne by the Department of Public Works from its appropriation for public grounds.

The regular work at the Nursery has gone on as usual; the most important features are the distribution of samples of Hawaiian grown seed to over one hundred foreign Botanic Gardens and similar institutions in different parts of the world; the local distribution of plants of the Central American rubber (*Castilla lactiflua*), better known under the old name of *Castilloa elastica*; and several applications for planting plans for forest plantations.

A grass fire in Nuuanu Valley on Sunday, June 30, was extinguished by the Deputy Fire Warden for Nuuanu Valley, Mr. G. H. Moore, before it did much damage. As a consequence of this fire an extension telephone bell has been put in at the Nursery, so that now some one of the employees of the Division can always be reached by telephone, day or night. The number is White 1991.

During June the various district foresters on the several islands were commissioned by the High Sheriff as special territorial police officers to enforce the new Bird Law (Act 104 of the Session Laws of 1907).

Miss Melika Peterson, the clerk of the Board, was absent from Honolulu on a vacation from June 12 to the end of that month.

The library room has been used during the period covered by this report as follows:

Hawaiian Entomological Society, June 6.

Hawaiian Poultry Association, June 12.

Hawaiian Poultry Association, July 10.

RALPH S. HOSMER,
Superintendent of Forestry.

Notes From the Reports of the Forest Nurseryman.

(June 28, July 17 and 29, 1907.)

Central American rubber plants (*Castilla lactiflua*), with circular letters, have been sent to over forty people in different parts of

the islands who are supposed to report from time to time on the growth and condition of the same.

Sample packages of seeds have been sent to ninety-six botanic gardens and other institutions in different parts of the world. Between forty and fifty packages were sent to each institution containing as many varieties of island grown seed.

FIRE IN NUUANU VALLEY.

On June 30th, at about 11:30 a. m., a fire broke out in the upper part of Nuuanu Valley. The fire burned over about 15 acres, the material burned being principally Hilo grass and staghorn ferns. Mr. G. H. Moore, Deputy Fire Warden for Nuuanu Valley, with his daughter and one laborer worked for five and a half hours fighting the fire, which they succeeded in putting out about half past five in the afternoon. The damage done was very slight. The fire was on the Waikiki side of the valley opposite the forest station.

SEED COLLECTING.

The collecting of seed has been continued and all around the city and the different valleys are being searched. Half a pound of camphor and a quarter pound of loquat seed have been received from the Yokohama Nursery Company in exchange for seeds sent from here. Three pounds of Japanese larch (*Larix leptolepis*) and five pounds cedar (*Cryptomeria japonica*), which were ordered sometime ago, have also been received.

There is no doubt a great many plants, new to the Territory, will be introduced through the exchange of seeds. We have already propagated a number of valuable plants from seeds received in this manner. Seeds have been received from the following:

Department of Lands, Sydney, 30 packages.

Public Gardens and Plantations, Jamaica, 13 packages.

The seed ordered sometime ago from the Union Nursery, Darbhanga, British India, consisting of 70 packages, has been received.

ADVICE AND ASSISTANCE.

Mr. Wm. Weinrich, manager of Sisal Plantation, has given notice that he will make applicaton for advice and assistance in the planting of trees on lands lately acquired by his company, at Wahiawa, Oahu.

A commencement has been made in the planting of trees on land lately acquired by Mr. C. Wight and examined by the writer a short time ago. The land mentioned is on the Waikiki side of Nuuanu Valley, just opposite Mr. Wight's residence.

An application for advice and assistance has been received from Major S. W. Dunning, commanding Fort Shafter. Major Dunning is anxious to begin the beautifying of his new post and has asked the assistance of this Division in the matter. Arrangements have been made for the writer to visit the post where he will meet Major Dunning and go over the ground with him.

MAKAWAO FOREST RESERVE—MAUI:

At the meeting held on July 29, 1907, the Board of Agriculture and Forestry approved the project to extend the area of the Koolau (Maui) Forest Reserve by the creation of an additional reserve of 1976 acres to be known as the Makawao Forest Reserve.

The section included is a part of the government land of Makawao, some times called the Haleakala Tract, lying on the north-western slope of Mount Haleakala. It has always been under a forest cover, its western limit, the Kahakapao Gulch, having for many years been the dividing line between forest and grazing land. The land is unleased and can be definitely set apart at once.

In accordance with the usual custom there are published herewith the reports of the Committee on Forestry and of the Superintendent of Forestry upon the proposed reserve, with the resolution adopted by the Board in regard thereto.

RESOLUTION RELATING TO THE PROPOSED MAKAWAO FOREST RESERVE.

Resolved, that that certain land in the District of Hamakua-poko, Island of Maui, bounded in general terms as follows:

Lying on the northwestern slope of Mt. Haleakala, bounded on the north and east by the Koolau Forest Reserve, on the south by the land of Kalialinui, and on the west and northwest by the remainder of the land of Makawao, and containing an area of 1796 acres, more or less, as recommended in a report of the Committee on Forestry, dated July 29, 1907, based on report of the Superintendent of Forestry, dated July 27, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on a map made in May, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 2394," and "Makawao Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1792, which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the Makawao Forest Reserve.

Resolved, that the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed Makawao Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Makawao Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on July 29, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Hawaii, July 29, 1907.

To the Commissioners of the
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry have had under consideration the report of the Superintendent of Forestry on the proposed extension of the Koolau, Maui, Forest Reserve, consisting of a part of the land of Makawao.

The propriety of including this in the general forest system of Koolau was considered and passed on favorably by your Committee on the 14th day of December, 1904. There is no question in the mind of your Committee that the tract under consideration should be declared a forest reserve. Your Committee, therefore, recommend the adoption of the report of the Superintendent of Forestry, and that appropriate resolutions be adopted recommending the setting apart of the above mentioned tract as a forest reservation, and that the Governor be notified of the action of the Board and requested to act thereon, as by law provided.

Respectfully submitted,

ALFRED W. CARTER,
C. S. HOLLOWAY,
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 27, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit a report with recommendations on a proposed extension of the Koolau (Maui) Forest Reserve, by the creation of a small additional reserve to be called the Makawao Forest Reserve.

LOCATION.

The area in question is that portion of the government land of Makawao, sometimes called the Haleakala Tract, in the District of Hamakuapoko, Island of Maui, to the east of the Kahakapao Gulch and between the Falls of Pali o ka Moa and the hill known as Puu Kakae. The tract may be roughly described as lying on the northwestern slope of Mt. Haleakala, bounded on the north and east by the Koolau Forest Reserve, on the south by the land of Kalialinui and on the west and northwest by the remainder of the land of Makawao, and containing 1796 acres.

DESCRIPTION.

Makawao is a government land. In December, 1874, it was leased to the Board of Education for a nominal sum, and soon after subleased by that department at a fair rental for the remainder of the term. The lease, which was held of late years by the Haleakala Ranch Company, expired on March 26, 1904, since then the land has continued to be used by the ranch under a tenancy at will. The land is therefore not now under lease.

The control of Makawao by the Board of Education explains the reason for the words "Board of Education" that appear across the land on the government map of Maui.

The question of the reservation of this part of Makawao has already received favorable consideration from the Board, in connection with a proposal made in November, 1904, by the Haleakala Ranch Company to exchange certain adjoining forest lands for the remainder of Makawao, whereby those lands and the portion of Makawao now under consideration were to be made a forest reserve. I submitted a report at the time which is now on file in the office of the Board. The proposed exchange was not approved by the Governor. Consequently the matter was dropped. Later when the question of setting apart the forested portion of Makawao again came up it was decided to wait until an accurate description of the boundary could be had. Such a description is now in hand and forms a part of this report.

OBJECT.

The objects of the proposed Makawao Forest Reserve are to afford permanent protection to the forest cover on the water sheds of the streams rising within its limits and to extend to its natural western boundary the forest area in part protected by the existing Koolau Forest Reserve. The arguments made for the creation of the Koolau reserve are equally applicable, so far as its area goes, to the tract now proposed to be set apart. These have already been set forth at length in my report on the Koolau Reserve and need not be repeated here as that report, made under the date

of July 28, 1905, was published in the Hawaiian Forester and Agriculturist for August, 1905, Vol. II, pp. 234-240.

THE FOREST.

The forest on the portion of Makawao now proposed to be set apart as a forest reserve, is the western end of the great Koolau forest that covers all the northern side of Mt. Haleakala. It is of the same character as that further to the east, being made up chiefly of Ohia Lehua and Koa. The area is drained by the gulches that make up the Waiahiwi Stream, which is one of the principal tributaries of the Maliko Gulch. These streams, although intermittent, are of value in connection with the other streams on the windward side of Maui.

The Kahakapao Gulch is the natural western boundary of the Koolau forest. Not only has it for many years been the dividing line between forest and grazing land, but it is also practically at the point where the area of heavy precipitation gives place to the drier climate of the Kula District. The reason for this change of meteorological condition is due to topography. Makawao lies on the shoulder of the mountain. The open lands beyond are subject to different wind currents from those under forest to the eastward.

PRIVATE RESERVE.

For the past ten years the proposed reserve has been treated as a private forest reserve by the Haleakala Ranch Company, which at its own expense has built and maintained fences to keep out the cattle. The gulch itself is a barrier part of the way but at both the upper and lower ends of the reserve fences are necessary. It may be said in passing that within the last two years the Haleakala Ranch Company has also fenced in and now maintains as a private forest reserve portions of its fee simple land of Kaliali-nui. The official recognition of this private forest reserve will be considered with other forest questions on Maui in a future report.

RECOMMENDATION.

For the reasons above set forth I now recommend that the Board request the Governor to set apart and create as the Makawao Forest Reserve the area within the boundary hereinafter technically described, in accordance with law, after the hearing required by statute.

DESCRIPTION.

[Here follows in the original a technical description of the Reserve boundary, prepared by the Survey Department. It is here

omitted as it also forms a part of the official proclamation, that will be published in full later, when the land has been set apart.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

NOTES.

The Japanese Rice Refining Company has declared a semi-annual dividend at the rate of 15 per cent. per annum. Its net profits for the year amounted to \$9,463.81.

The reputation of the Hawaiian pineapple is extending beyond the mainland and a demand for it is said to have arisen in London and Paris. From the latter city one of the largest importers of canned fruits in France, is seeking to establish business relation with Hawaiian canners.

A company has recently been organized to engage in the production of copra in the Koolau district. Although the coconut does not reach perfection in these islands there is every prospect of the industry being successful here, as it will be conducted on land of little other agricultural value.

The Kona Vineyards Company, Limited, has filed its charter with the Territorial Treasurer. The main purpose of the company is wine growing in Kona, Hawaii. Its present capital is \$50,000, with the privilege of increasing to \$1,000,000. This is the second wine making company to incorporate in the Territory, the first one being in operation on Maui.

The Kaupakalua Wine & Liquor Company, of Maui, will produce twelve thousand gallons of wine this season. The area of available land throughout the islands suitable for the cultivation of the grape is enormous and the success of the local vineries should encourage the wide extension of the manufacture of wine within the next few years.

Mr. J. E. Higgins, horticulturist of the Hawaii Experiment Station, has gone to the Coast with a consignment of fifteen tons of island fruit, consisting of pineapples, avocado pears, bananas and papayas, in order to market them as far East as Chicago, with a view to popularising them on the mainland. This is the second experimental shipment conducted on a large scale by the Station, which hopes by this means to create a regular demand for Hawaiian fruits in markets hitherto looked upon as inaccessible to our growers.

IMPROVING HAWAIIAN PASTURES.

BY G. C. MUNRO.

In August, 1899, when I took over the management of the Molokai Ranch, there was evident necessity for improvement in the pastures on the extent of semi-arid and partially denuded land on the estate. The various boards of directors, under whom I served, aided and encouraged me in every way in the work of introducing and experimenting with foreign grasses and forage plants to assist in this object.

It has therefore been my privilege to make some of the first growing trials here and to have made the first practical demonstration of some grasses which I feel sure will eventually revolutionize the stock raising industry of the Islands.

The plan followed in the first trials was this, to procure seed in small quantities of any grasses that might seem suitable. A small amount of each was sowed in the garden and tended, the rest being mixed and sown broadcast over as great an area and under as many varying conditions of locality and soil as possible. The garden plots were tested for drought-resisting qualities, and were a guide to the identification of the grasses in the open. The broadcast sowing was a test for self-spreading and general adaptability to local conditions, for it is necessary for a good range grass, especially in dry country, that when established it will seed quickly and plentifully and spread without much artificial help. When once a grass showed itself worthy of propagation, and was found to thrive in the open, seed was bought in larger quantities, and in some cases land was plowed and prepared for the seed.

In carrying out the initial experiments in this way the expense was very light, though there was a considerable amount of clerical and inspection work necessary.

That the improving and maintaining of the pastures is one of the main points in stockraising is undoubted, and worthy of much more attention and expenditure than is at present given it here. Thousands of acres of what is now almost useless land could be brought into use, and a rotation of useful feed crops could be grown on resting cane land which would more quickly bring back those constituents of which the cane has deprived it of than is achieved by weeds which now accomplish this object. The expenditure in fertilizers would also be reduced.

A system of dry farming is drawing much attention at present and gives wonderful results in dry country. But few countries can depend for any lengthened time on natural pastures, it being found profitable eventually to improve on natural conditions, to grow better grasses, to cure hay and ensilage for use in seasons and periods of scarcity, and also to grow fodder catch-crops.

This is a feature in the agriculture of parts of the United States, Australia and the Argentine Republic, and nothing impressed me more in my recent visit to New Zealand than the improvement in the pastures, principally from adopting improved methods.

By growing paddocks of suitable grasses, and keeping them for seed for distribution over the ranch, is perhaps the best method to follow on these Islands. A great deal can be done by simply gathering the ripened seed heads and scattering them over the pastures, or by turning the stock in when the seed is ripening and then distributing the animals over the land to be seeded. This latter is an old and somewhat rough method, but it is inexpensive and very effective in some cases; some seeds such as those of *Paspalum dilatatum* are improved in germinating quality by passing through the animals. Another method is to fence in long narrow paddocks across the wind and to plant them with the grass which it is desired to introduce.

Seed will also be distributed by allowing hay to ripen to some extent before cutting; the eventual feeding of the hay will spread the seed. Sufficient resting spells should be given any pasture at suitable times, as nothing runs a pasture out, and especially a dry pasture, so quickly as continuous stocking with the same class of animals. For their favorite food plants being kept continuously eaten down, and not allowed to seed, are eventually killed. The ground is also in the meantime gradually taken up with less desirable plants. A rotation of different kinds of stock, with intervening rests, is beneficial not only to the pastures, but has a direct influence on the health and condition of the stock and on the reduction of their parasites. In fact the success of stock raising for profit probably hangs more on the care and judgment given to this than anything else, for no matter how well bred one's stock may be, unless it be properly fed and kept in good health, it will not bring full profit.

On the Molokai Ranch I found that by resting the pastures, grasses almost killed out came gradually back, and the feed was much improved. Of course on all ranches this could not be followed. At first there was great difficulty in getting information on drought-resisting grasses. Then the bulletins of the Department of Agriculture were consulted, and later other publications treating on this subject, principally the Australian Government publications, for the same problem has been confronting several countries in the last number of years. Another difficulty was to get seed, most of the plants we desired to try not being in cultivation and the seed not in the market.

The opening of the United States Experiment Station under Mr. Jared G. Smith, who has wide experience in pasture grasses and in investigating the problem of regrassing denuded arid range country, helped us in this, and brought additional opportunities to the Hawaiian stock raisers. Mr. Smith has taken much inter-

est in the work and has been instrumental in introducing the seeds of a great number of grasses and fodder plants for trial under dry conditions. Many of these will no doubt eventually prove valuable.

The first lot of seed was received from him in 1903 and sowed early that year and though nearly all grew and many seeded, yet few gave promise of being permanent grasses.

Andropogon saccharoides, feather sedge grass, seeded and spread to some extent, and subsequent lots of seed received under the name of "fuzzy top," the same grass or a variety of the species, gave greater promise. The latter seeded well and lived through the droughts. It is growing very strongly this year, and will, I think, be a valuable addition to the dry land grasses.

Sporobolus wrightii showed remarkable drought-resisting qualities and grew from scattered seed on the salty land. It also grew on the higher dry country, but did not make much growth. Others that have shown well are as follows: *Bouteloua curtipendula*, side oats, or tall grama, is the best of the gramas and did well from scattered seed. It grows well and seeds on pretty dry country. *Bouteloua hirsuta*, black grama, did well in the garden and yet may show in the open.

Sporobolus cryptandrus did well in the garden and will, I think, yet make a showing in the pastures, as it seems very hardy and seeds freely with little moisture. *Mulenbergia petreii*, *Hilaria mutica*, *Panicum bulbosum*, sand lucerne and Turkestan alfalfa are other drought-resisters. The above are all perennials.

A number of annuals were tried, grasses, beans, and salt-bushes. Of the two former there were no results of any note. Each seeded one season and did not show any more.

Of the many saltbushes tried, *Atriplex nuttallii*, Arizona salt bush, was one that gave much promise. This saltbush sown in 1904 took well on the salty seaside land, was eaten down to the ground by the cattle in the dry season. In the next dry season, some of it in the mean time being fenced from the stock, grew in a dense bush up to about five feet high and proved very succulent and seeded heavily. The bushes outside the fence were again eaten to the ground, and some of them killed outright so that it would seem probable that this plant could be best used in conjunction with the kiawe bean, by growing it in fenced paddocks and not feeding it too closely. It is evidently a valuable plant for the shore line and should be fully tested. Anything that will furnish a roughage in feed, even if not very nutritious, will be valuable in the kiawe belt. Often so little rain falls on the adjacent lands that little grows there and the stock has no change from the beans except the sea side weed, which is not relished by the stock. *Atriplex semibaccata*, Australian salt bush, was one of the first plants I tried, getting some seed from some growing as a pot plant at the residence of a resident at Kaunakakai in 1899. I had seen it planted some years before by Messrs. Gay

& Robinson on the Makaweli Ranch, the seed being procured from Mokuleia Ranch, where it was then growing, introduced probably from Australia by the late Mr. Tom Gay, then manager of that ranch.

I procured a few pounds of seed from California and in the wet season of 1900 and 1901 spread it over the ranch. It is now well established in several places on the dry salty land along the coast, though it may to some extent be eventually choked out by the kiawe forest. It grows through the driest weather, furnishing some feed in the dry months and ripens a great amount of seed which is spread over the surface by the stock and the rains, and grow freely. It only succeeded well on Molokai near the sea. In Australia it is a valuable sheep feed and is a great deterrant of worms in sheep and lambs. It should be planted on any sheep ranches with salty land. The seed need only be strewn on the bare surface during the dry season.

Paspalum dilatatum: This grass is, I think, worthy of first place. Though not the best drought-resister, it combines many essential qualities needed for this country. My attention was first drawn to it by mention in a New Zealand paper, and I tried it in the latter part of 1903. I believe Mr. F. G. Krauss, instructor of agriculture at Kamehameha School, also made successful experiments with it in the same year. It has shown itself so well adapted to the ranch that nearly 2,000 pounds of seed were imported and sown in the last two years. Its advantages are these: It is a very strong quick-growing grass in the warm months with a reasonable amount of moisture. It is a heavy seeder and provides a tremendous amount of feed which is relished by horses, sheep, cattle and hogs. It is good for milk production and for fattening, and will stand any amount of stocking when growing. In fact it cannot be eaten too closely at that time. It will stand as much and perhaps more drought than *manienie*, and though it is credited with taking up the land to the exclusion of other grasses, this will not likely happen here, as on the dry country it will no doubt be killed back to some extent in the dry seasons. On the moister lands it will be some time in overcoming such grasses as *manienie* and buffalo grass, and others less desirable, and even if it takes up the middle country it will be more of an advantage than anything else. Clovers, however, grow well with it, which should enhance its value as a fattening feed. The seed of *Paspalum dilatatum* does not germinate readily, and requires a certain amount of shade and a continued term of moisture, so that it can with advantage be sown amongst other grasses. The seed will not start till the requisite amount of rain has fallen to insure the growth of the seedlings. If summer showers start the easily germinating seed, the plants die if the weather continues dry. After sowing there may be little sign of the grass for a year or more.

Paspalum dilatatum is a heat lover and grows most rapidly under conditions of heat, provided it has moisture. It will thrive at the frost line, but makes very little growth there in the cold months. This, however, is not much of a detriment as during these months feed is usually most luxuriant on the lower country, and it comes in the hotter and drier months when the annual grasses are dead and most perennials are growing but little. It will be of especial value on ranches with a large proportion of dry country, as a stand-by for the dry season on the middle lands, much of which at present under pilipiliula and other inferior grasses. These carry but a small proportion of stock to what they would do under *Paspalum dilatatum*. I have planted roots of this grass amongst thick pilipiliula and it has steadily gained ground. When growing amongst thick manienie I have run a fire through the latter and though the paspalum was scorched by the fire, in a few days it had sent out fresh shoots several inches long, before the manienie had got a start. The greatest drawback with it is the difficulty in collecting the seed, as the seed even on individual seed heads ripens unevenly. To collect good seed it is best to shake the seed heads over a flat pan. This should be repeated at intervals whilst the season lasts.

Ranchers are sometimes disappointed at the non-appearance of plants after sowing. This may, of course, be due to bad seed, but may be that the conditions have not been favorable to its germination. With altered conditions it may later on show up. Again roots may be planted in the wet and coldest months and very little growth be apparent for some time, but as soon as the warm weather sets in it will grow luxuriantly.

On account of being unable to harvest seed with a high percentage of germinating quality by machinery, the seed from Australia where the price of labor is higher than here, is necessarily high, and the best plan would be for the ranchers here to raise their own seed, taking care that the seed paddock is situated where it will get rain during the warmer months, when a maximum amount of seed can be gathered.

On the Molokai Ranch, at an elevation of about 1,000 feet, it seeds twice in the year, in the earlier and later months of the wet season. Between 800 and 1,200 feet is, I think, the best location to establish it. Planting the roots was originally practiced, but I think the best plan is to sow the seed broadcast over the pastures where the other grasses do not completely cover the ground. Once established in a locality I believe that periodical burning of the thick manienie will bring it in over the areas covered with this grass, as the stock will distribute the seed of the paspalum, which will come up amongst the annual grasses that follow these fires.

Whether the fire would have this effect on the pilipiliula land I do not know, and perhaps plowing would be necessary where it is very thick. When lands covered with pilipiliula at an eleva-

tion of about 1,000 feet and above this to the frost line, are taken up by *Paspalum dilatatum*, it will be a great stand-by in the dry season, and even as fattening pastures.

Paspalum dilatatum is a native of South America and its value as a pasture grass has been demonstrated in Australia where it was introduced about 30 years ago. Of late years it has revolutionized the dairying industry of some of the States of the Commonwealth. *Paspalum virgatum* is attracting notice in Australia, I tried it, but had no success, probably from bad seed.

THE IMPORTANCE OF THE FOREST.

"The forest and water problems are perhaps the most vital internal question of the United States."—President Roosevelt.

"Of the wheels of public service that turn under the Indian Government there is none more important than the Department of Woods and Forests."—Kipling.

"How foolishly men destroy the forest cover without any regard for consequences, for thereby they rob themselves of wood and water."—Humbolt.

"Agriculture is a profession and occupation which a man may spend a lifetime and at the end say in all sincerity that he has still got far more to learn than he knows. It is only the ignorant who have nothing more to learn."—*Journal of the Jamaica Agricultural Society*.

(To be continued.)

BY AUTHORITY.

Notice is hereby given that W. M. Templeton, Esq., has been appointed District Fire Warden in and for the District of Waialua Island of Oahu.

Notice is hereby given that W. W. Goodale, Esq., has been appointed District Forester in and for the District of Waialua, Island of Oahu.

Honolulu, T. H., August 7, 1907.

Notice is hereby given that August Ahrens, Esq., has been appointed District Forester for that portion of the District of Hamakua, from and including the Waimanu Valley to the District of Hilo; and District Fire Warden for the western part of the District of Hamakua, extending as far as the west boundary of the land of Paauhau, Island of Hawaii.

C. S. HOLLOWAY,

President and Executive Officer Board of Agriculture and Forestry.

Honolulu, T. H., August 12, 1907.

DIVISION OF FORESTRY.

THE PIIHONUA FOREST.

On June 17, 1907, the Commissioner of Public Lands submitted to the Board of Agriculture and Forestry a request for information on an application for lumbering rights on the land of Piihonua, Hilo, Hawaii.

Approving the recommendations of the Superintendent of Forestry and the Committee on Forestry, the Board submitted to the Governor the recommendation that no lumbering be permitted on this land. Governor Carter sustained this action by refusing to grant the desired license.

Following are the reports of the Committee on Forestry and of the Superintendent of Forestry, approved by the Board, in regard thereto.

The recommendations made in these reports are significant as they more strictly define the policy of the Board in regard to lumbering than does any action heretofore taken. What is now approved is, however, quite in line with action previously taken by the Board, as may be seen by reference to an article entitled "The Policy of the Board in regard to Lumbering" that appeared in the *Hawaiian Forester and Agriculturist* for November, 1906, Vol. III, No. 11, pp. 368-373. In this connection special attention is called to the last paragraph of the report of the Superintendent of Forestry that forms a part of that article.

ACTION BY THE BOARD.

Extracts from the minutes of the Board of Commissioners of Agriculture and Forestry. Meeting of July 29, 1907.

Moved and seconded that the report of the Forestry Committee relative to the suggested lumbering of Piihonua be adopted. Carried.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Hawaii, July 29, 1907.

To the Commissioners of the
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry has had under consideration the report of the Superintendent of Forestry, on the question submitted to this Board by the Land Commissioner of permitting lumbering on a part of the land of Piihonua, in the District of Hilo.

Your Committee has carefully considered this report and the reasons given by the Superintendent of Forestry for his recom-

mentation against lumbering the tract mentioned. The reasons set out in the report appear to your Committee to be sound, and should be followed by this Board.

After a careful consideration of the matter your Committee recommends that the report be adopted.

Respectfully submitted,

ALFRED W. CARTER,
C. S. HOLLOWAY,
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 18, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report on the question of permitting lumbering on the land of Piihonua, District of Hilo, Island of Hawaii:

This report is made in reply to a request received from the Commissioner of Public Lands on June 18, 1907. It is based: (1) on an examination of the land made at the end of June, 1907, during which I saw as much of Piihonua as can be seen without the cutting of a considerable number of trails through heavy undergrowth and across swamps; (2) on all the other evidence in regard to the character of the land that I could obtain, and I believe I have practically all that is available. I have given the matter most careful consideration from every point of view and I conscientiously believe that I am acting for the best interests of the Territory in making the recommendations that follow.

DESCRIPTION.

Piihonua is a government land, under a crown lease to the Hon. John T. Baker of Hilo. The lease (No. 531) expires on March 21, 1921. The upper part of the tract is sublet to Mr. W. H. Shipman and constitutes the Puu Oo Ranch. The lower line of Mr. Shipman's lease extends almost due north across the tract from the point on the 1855 lava flow, known as Reed's Island, at an elevation of approximately 5,000 feet. The lower portion of the tract is covered by the fields of the Hawaii Mill Company's sugar plantation. The cane lands reach up to an elevation of about 2,000 feet.

The section between the cane fields and a forest fence constructed by Mr. Shipman at some distance above the line of his lease, constitutes a part of the Hilo Forest Reserve, established in July, 1905.

Between the limits named the land is heavily wooded. On the lower and middle sections the forest consists of a mixed stand of Ohia Lehua and Koa trees, mainly of large size. At an elevation of approximately 4,500 feet is a belt of pure Ohia forest. Above this and extending to and above the Shipman fence the forest is again composed of Koa and Ohia, in mixture. Throughout the forest is a heavy undergrowth consisting of tree-ferns, low shrubs and small trees, and high growing ferns and brakes. In places are tangles of ie-ie vine and uluhi. The soil where exposed is a reddish clay, a foot to eighteen inches or more in depth.

The belt of pure Ohia is evidently the point of greatest precipitation from the trade wind clouds; though throughout the forest, from the plantation clearing to the Shipman line, the rainfall is heavy. All over the area are springs, pools and swamps that feed the numerous small tributaries to the Wailuku River and its several branches. Practically the whole drainage basin of this stream is on Pihihina, for the water that comes from higher up than the section watered by the trade wind clouds is limited to the flow resulting from Kona and other local storms.

Very little is known accurately of the actual sources of the water in the streams, or from which part of the forest they are most largely fed. But the indications are that from one-third to one-half of the water comes from the area of pure Ohia forest, above described, while the remainder is the result of springs and swamps lower down. These springs are dependent for their sustained and equalized flow on the protection afforded by the forest cover.

At present the water from the Wailuku river is used for fluming cane and for turning the power wheels of the Hilo Electric Light Company. For these purposes it is diverted at points near or below the 2,000 foot level.

RECOMMENDATIONS.

Having given the problem thorough and careful study, both on the ground and in its various relations, I cannot report favorably on the proposition to lumber this tract. My principal reasons for this decision are three in number.

First: I believe the greatest value of the forest on Pihihonua to be in the influence which it has on the drainage of the Wailuku River and its branches, i. e. on the affect the forest exerts on the water after it reaches the surface, by equalizing the flow and preventing excessive run off. In view of its present use and possible further development for water power, irrigation and even for domestic supply—especially in connection with the growth of

Hilo town—I regard the Wailuku as one of, if not the, most important stream protected by a forest reserve in the Territory.

It might be possible, if the work were done under careful restrictions, to remove some of the mature trees from the Piihonua forest without detriment to its water conserving qualities. But to make lumbering profitable the operations would have to be conducted on a large scale. This would inevitably involve the opening up of considerable areas in sections where a complete forest cover is most needed. Such a policy on this particular water shed would be fraught with danger. It is a risk which I do not believe the Territory should take. For the money to be obtained as stumpage would in no way compensate for the injury that would result were the regular flow of the Wailuku River seriously interfered with.

For this reason I am opposed to lumbering the forest on Piihonua.

Second: The forest policy of the Territory has been and is to create a chain of forest reserves that are essentially "protection forests." On the leeward side of the island, where because of the absence of running streams watershed protection does not figure, I am in favor of utilizing the merchantable timber. But on the windward side of Hawaii I believe that the forest in the several established forest reserves should for the most part be kept intact, at any rate for the present.

If this is so in general it is particularly true of the Hilo Forest Reserve; for with the growing importance of Hilo town and the Hilo District, through the construction of the breakwater and the building of the Hilo-Kohala Railroad, the streams coming from the reserve will be needed more than at any time in the past.

Considering the large area of privately owned land in the Hawaiian forest reserves it is essential that a uniform and consistent policy of forest protection be maintained, in order that the owners of this land may be brought to coöperate with the Government in its management. The granting of logging rights on such a land as Piihonua would, I fear, tend to weaken the public sentiment that supports the reserve work, if indeed it did not react unfavorably on the whole forest policy of the Territory.

Therefore, on this count also, I believe the logging of Piihonua to be inexpedient.

Third: My third reason is from a professional standpoint. Forestry rests on a business as well as on a scientific basis. In the consideration of such a problem as the lumbering of the Piihonua forest, the factor of whether or not it would pay is an essential one.

Even were it desirable that lumbering should be permitted, it would in my judgment be necessary, in order to safeguard the favorable conditions of stream flow that now exist, to load the con-

tract with stringent regulations as to the area to be logged, the methods to be used and the subsequent treatment of the tract. From the situation of Piihonua in relation to transportation, the cost of logging would at best be high. When to this were added the necessary restrictions and stumpage at the price which I believe the Territory should demand, I cannot see how there would remain any margin of profit for the contractor undertaking the work.

Looking at the matter in this light I should not be justified from the standpoint of professional ethics, in tacitly recommending the project by approving conditions under which logging might be carried on.

On this third count, then, I cannot recommend lumbering on Piihonua.

I recommend, if the Board approves this report, that copies be sent to the Governor and to the Commissioner of Public Lands.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

IMPORTANT PUBLICATION.

The New Agriculture, by T. Byard Collins, 12 mo., 374 pages, 106 illustrations, cloth, price \$2.00. Messrs. Munn & Company, New York.

We have great satisfaction in bringing before our readers the above publication which has recently been issued from the Scientific American press. This work deals with the realm of agriculture in an authoritative manner and from a new and attractive view point. The author has devoted a life time to the study of changing economic agricultural condition and urges the call of the farm as an alluring and profitable undertaking. Farm life was never so attractive as today, and its call is alluring thousands from office work. The drudgery of the old farm has passed away and the use of improved methods, perfected machinery, and newly evolved stock, has created a greatly increased means of attaining wealth by enhancing the value of the product and by decreasing the cost of production.

The slogan "Back to the Soil" strikes the keynote of the opening chapter of the book. We stand on the threshold of an era wonderful in the annals of agriculture: an era in which experiment, invention and experience will transmute the labor of the field into wealth and health and happiness and length of days. The invitation is to all men and is being eagerly embraced by all classes. Lands before considered worthless, now bloom and blossom as the

rose. Roads formerly impossible or impracticable are now transformed into highways of profit and delight. Frosts are defied by newly created varieties of fruit and grain. The seedless apple and the pitless plum have been attained. The size of fruits and flowers and roots have been doubled and the mystery of transmuting the colors of nature has been solved. And so far only the first step has been made into the realm of the agriculture which the new century has ushered in.

The vast systems of irrigation which are transforming the great West are treated at length. By means of these achievements the uncertainty of the agriculture of yesterday resolves itself into the certainty of today. Irrigation projects bring about a more even and general prosperity, more compact communities and better social opportunities.

The principles and importance of fertilization and the possibility of inoculating the soil by means of nitrogen-gathering bacteria are given due importance and a chapter is devoted to the importance of canals and good roads and to their relation to economy and to social well being.

One of the most interesting features of the book is its description of new industries. Among those described at length are the rice fields of Louisiana and Texas, the keeping of the angora goat for its fleece, the cultivation of the Smyrna fig and the date, the production of tea and the manufacture of perfumery and drugs.

A most fascinating account of the manner in which experimenters are endeavoring to subject to human control, the size and shape, the color, taste and odor, the fecundity and inherent qualities of the whole of plant life, is presented. The "white blackberry," the "citrange," the seedless apple, the "tangelo" and many other marvellous blends are described.

The latter part of the book describes the practice of the new agriculture and the new machinery which has recently been brought into operation.

The New Agriculture is excellently illustrated with over one hundred half-tone illustrations—the majority of them full page. We heartily recommend this work for general reading and also as a handbook of practical usefulness. Its careful perusal should act as an inspiration to many a toiler at the desk and should assist many a youth to a decision of life's vocation.

U. S. IRRIGATION AND DRAINAGE INVESTIGATIONS.

Bulletin 191, Tests of Internal-Combustion Engines on Alcohol Fuel.

The tests reported were made on engines using both gasoline and alcohol. Detailed results in fuel consumption and in power produced are given.

Application for this bulletin should be made to the Office of Experiment Stations, Washington, D. C.

*WOLVES IN RELATION TO STOCK, GAME, AND THE
NATIONAL FOREST RESERVES.*

By VERMAN BAILEY, U. S. Department of Agriculture, Forest Service,
Bulletin 72.

The above publication, although touching a condition of agriculture from which these islands are most fortunately exempt, is of great interest to the general reader and we therefore refer briefly to some of its chief data:

The enormous losses suffered by stockmen on the western cattle ranges and the destruction of game on forest reserves, game preserves, and in national parks through the depredations of wolves have led to special investigations by the Biological Survey in coöperation with the Forest Service, to ascertain the best methods for destroying these pests. The results appear in the present report, which includes also field notes on the distribution, abundance, and breeding habits of wolves.

The chief object of the report is to put in the hands of every hunter, trapper, forest ranger, and ranchman directions for trapping, poisoning, and hunting wolves and finding the dens of young. If these directions are followed it is believed that the wolves can be so reduced in number that their depredations will cease to be a serious menace to stock raising. Prime wolf skins are worth from \$4 to \$6 each, enough to induce trappers and enterprising ranch boys to make an effort to secure them if a reasonable degree of success is assured. Stock owners need little encouragement to catch or kill wolves on their own ranges, and it is believed that the forest rangers will be able to keep them down on the forest reserves. Their complete extermination on the western range is not, however, to be expected in the near future, and it is only by constant and concerted effort that their numbers can be kept down sufficiently to prevent serious depredations.

The wolves of North America are divided into two groups—the smaller coyotes, or prairie wolves, of the western United States, Mexico, and south-western Canada, comprising several species and subspecies; and the larger gray, black, or timber wolves, distributed practically throughout the whole of North America from Florida and the table-land of Mexico to the Arctic Ocean.

The stock killed by wolves is mainly cattle. Calves and yearlings are generally selected, but if these are not available, cows, and even full-grown steers, are killed. They are usually attacked from behind and literally eaten alive. Occasionally an animal will escape the wolf with a great piece torn out of its ham, while the wolf goes on to catch and kill another. The ranchmen in the wolf country maintain that a "critter" even slightly bitten by a wolf will die of blood poisoning, and many detailed instances seem fully to substantiate this. More cattle are therefore killed than are eaten. Evidently the wolves prefer freshly killed beef. In summer they rarely return for even a second meal from the same animal; but in winter, when in the snowy north the cattle are gathered into pastures or stables, they often return to a carcass until its bones are picked. The actual number of cattle killed by wolves can not be determined.

A considerable number of colts and a few grown horses are killed by wolves, but the number is insignificant compared with that of cattle. Evidently this is not a matter of choice of food, for trappers generally agree that wolves prefer horseflesh to beef.

Herded sheep are rarely troubled by wolves, which are kept at a distance by the presence of herders and dogs. Occasionally, however, an unguarded herd is raided and a large number of sheep are killed, but so rarely that in open country sheep men have little fear of wolves in comparison with coyotes and wild-cats. Goats and hogs are, however, frequent victims of wolves, which in some States kill great numbers of these

animals. The amount of game killed is less easily determined than of cattle, but, judging from the evidence obtained, wolves kill far less game in the western United States than either coyotes or mountain lions.

As protective measures against the depredations of wolves fences are recommended. Bounties, even when high, have proved ineffective in keeping down the pest and the more intelligent ranchmen question whether the system pays.

The methods usually employed for the destruction of wolves are hunting with rifle or with dogs and horses, capturing the young in the dens, trapping, and poisoning, a description of each of which expedients is given. Most of the wolves trapped are less than a year old, generally spring pups caught the following fall or winter. After a wolf has reached his third year and run the gauntlet of traps, poisons, guns, and dogs, its chances of dying of old age are excellent. Around the dens the old wolves are especially wary, and so suspicious of both traps and poison that attempts to catch or poison them are futile. Scents and baits make them only the more suspicious.

THE NEW ANTI-OPIMUM REMEDY.

Mr. L. Wray, Director of Museums of the Federated Malay States, has published in the *Journal of the Federated Malay States Museums* an account of the new anti-opium remedy and of the results obtained from its use in Selangor. As the subject has aroused considerable interest both in this country and on the Continent, a brief abstract of his article may prove of interest.

The discovery of the property of the plant is told by two of the men in charge of the factory of the Selangor Anti-Opium Society in Kuala Lumpur. A party of Chinese wood-cutters, working in the jungle near Seremban, ran out of tea, and to supply its place took the leaves of a jungle climber, dried them, and used them as tea in the ordinary way. But the beverage made the men ill with bowel complaint. The leaves were then roasted, and a fair substitute for tea was obtained, which had no ill effects. Then, for some obscure reason, some opium dross, consisting of the refuse opium after being smoked, was mixed with it, and the men continued drinking the mixture for a week or more in place of tea. After this time it was found that all desire for opium-smoking had been lost. Friends of the men made known the discovery, and so the news was spread, and other men were induced to try the remedy. Mr. Wray suggests that the plant may act as an astringent, preventing the distressing intestinal troubles which usually supervene on a stoppage of the customary supply of opium, and render it difficult to leave off its use. The mode of preparing the remedy is as follows: About 8 oz. to 10½ oz. of the roasted leaves are boiled for about three hours in about four gallons of water. The liquid is then strained through a white cloth and poured into barrels, and supplied direct from the barrels to the bottles brought by the patients; but, as the infusion contains no preservative, it is readily subject to fermentation, and often has to be thrown away and a fresh supply obtained.

The decoction is prescribed thus: Whatever the amount of opium a man habitually smokes, that amount is to be mixed with the infusion. It may be mentioned here that the average opium smoker takes from two to three chi (116 2-3gr. to 175gr.) of chandu per diem. This quantity is often exceeded, and in one case 1½ tahlil (875gr.) is stated to be the daily allowance of a particular smoker. Chandu, which is the opium as prepared by the Chinese for the use of smokers, is less potent than the official extract of opium of the British Pharmacopœia. In the act of smoking a considerable quantity of the alkaloids contained in the chandu is certainly destroyed, and only a mere fraction is absorbed into the system of the smoker. To proceed, if, for instance, a man has been in the habit of smoking two chi

of chandu per day, then two reputed quart bottles (a) and (b) of the infusion are taken, and into one (a) is put two chi of burnt chandu, roasted on an iron skewer-like instrument in the same way as it would be if being prepared for smoking. Then a Chinese teacup is half-filled from bottle (a) and taken by the patient, and half a teacup from bottle (b), the one that does not contain any opium, is put into (a). This is repeated each time a dose is taken, so that the liquid in (a), while containing its bulk, continually decreases in its opium contents until the bottle (b) is exhausted. The dose is to be taken as many times a day as the patient has been in the habit of smoking, usually three or four times, until the two bottles are finished, when the man should, it is stated, be cured of all wish to smoke. If this is not the case, then the treatment is to be repeated, but with a smaller initial proportion of burnt opium in bottle (a), the amount being again decreased if a third course is necessary. It is stated that sometimes two courses are sufficient, but generally three are required.

At the Weld-road establishment of the Selangor Anti-Opium Society in Kuala Lumpur, from November 16 to 23 last, about 396 patients had reported that they were completely cured of the habit. Before that date no records were kept. Many patients naturally do not trouble to return and make a report. The Rev. W. E. Horley wrote on December 6 that about 8,000 people had applied at the Methodist Episcopal Mission hall in Sultan street, Kuala Lumpur, and over 7,000 in Ipoh, Perak, within the last few weeks. It is instructive to note that the monthly official opium returns showed during November a decrease of 38 chests of opium and in December 32 chests, the lesser number in December being probably due to the return of a certain number of patients to their opium pipes. The success obtained has led to the opening of branches of the Selangor Anti-Opium Society at Kepong, Rawang, Serendah, Sungei, Besi and Kajang.—*Mail*, May 24, 1907.

BY AUTHORITY.

Notice is hereby given that R. von L. Domkowitz, Esq., has been appointed District Forester for that portion of the District of South Kona, extending from the District of Kau to the land of Kaohe; and District Fire Warden for that portion of the District of South Kona, extending from the Kau District line to and including the land of Kaapuna, Island of Hawaii.

Notice is hereby given that A. W. Carter, Esq., has been appointed District Forester for the District of South Kohala, Island of Hawaii.

Notice is hereby given that Samuel M. Spencer, Esq., has been appointed District Fire Warden for the District of South Kohala, Island of Hawaii.

Notice is hereby given that C. J. Austin, Esq., has been appointed District Forester for the District of Hana and that portion of the District of Koolau, lying between the District of Hana and the Makapipi Gulch, Island of Maui.

Notice is hereby given that W. F. Pogue, Esq., has been appointed District Forester for the Eastern half of the District of Hamakualoa and that portion of the District of Koolau, lying between the Hamakualoa District and the Makapipi Gulch, Island of Maui.

C. S. HOLLOWAY,

President and Executive Officer Board of Agriculture and Forestry.
Honolulu, T. H., August 5, 1907.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION.

BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by E. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by E. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp.; cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

* Out of Print.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. IV

SEPTEMBER, 1907

No. 9

We publish in this issue a contribution from Mr. Jacob Kotinsky upon the opportunities and future sphere of work of the College of Agriculture and Mechanic Arts, which is now in process of formation in the Territory. The Forester has already contained the expressions of opinion of many prominent citizens upon the utility and work of the new institution, but the general interest which is taken in its operation warrants the publication of still further information on this important subject.

The writer of the present article speaks chiefly from the agricultural standpoint, being justified in doing so by his graduation in agriculture from a State College, and also by a three years' residence in the Territory. During this time he has been intimately associated with the agricultural problems of the islands and with the methods of bringing about their solution. We feel, however, that his paper relates as cogently to the mechanic art phase of the question, and it is only the writer's desire not to appear too didactic, that has induced him to confine his observations to that part of the subject which has fallen more directly under his observation. His close study of the economic development of other countries allows him moreover to approach the subject from a different viewpoint than that of writers of former papers which have been published, who generally have been restricted to treat only a certain phase of the question.

It is axiomatic that the true sphere of work of the new College of Agriculture lies wherein it will affect from an agricultural and mechanical point the greatest good, to the greatest number of the residents of the Territory. This certainly would seem to point to concentrating its chief energies to increasing the agricultural and mechanical efficiency of that part of the community whose inclinations will lead it to remain

in the Territory, and by this means, permanently increase the economic prosperity of the islands. It will also probably be admitted that the development of the curriculum of the college should proceed by natural growth from the elementary to the advanced.

The citizens who appear to offer the most ready material for the new institution to operate upon are primarily the Hawaiians and the Portuguese. There is also, of course, a very considerable number of other nationalities awaiting to participate in the benefits of the college, but the two peoples already mentioned would probably form the bulk of those whose lot could be most readily reached and ameliorated. Upon such people, imbued with a love of the islands, practical courses of instruction would most readily affect the local standard of efficiency, for they would remain in the Territory and become a permanent factor in the development of the community.

The desire to make Hawaii a center of tropical agricultural learning and practice is a laudable one, as is also the wish to create in our midst an institution of advanced academic instruction. These objects can, however, only be achieved by many years of patient upbuilding. It should also be remembered by those who wish the new institution to attract students from the Mainland to study tropical agriculture, that such visitors would in all probability seek an outlet for the expression of their knowledge in other countries, and that they would do little for the welfare of Hawaii. It is also to be considered that our islands are, strictly speaking, not tropical and any great success attending a local institution of tropical agriculture would induce the establishment of like colleges in countries more favorably situated for tropical experiment, to which those desiring actual tropical experience would no doubt repair. It therefore would certainly seem our best policy to make the attraction of mainland students a minor consideration and to concentrate the chief energies of the new college to the advancement of those of our population who are most likely to add to the economic prosperity of the Territory.

OUR AGRICULTURAL COLLEGE IN THE LIGHT OF OUR NEEDS.

BY JACOB KOTINSKY.

Before proceeding I must explain that in the discussion to follow I have particular reference to the course in agriculture. While I have an opinion as to the aims of the Mechanic Arts courses, it is not that of the confidently competent judge, being out of my line of activity,—nor is this the place. But as a graduate in agriculture from one of our State colleges (New Jersey) and as a 3 years' resident of this Territory who has made a conscientious study of the needs of these islands in this respect, I feel in a position and obligated to voice my sentiment in the matter. In this sentiment I know I am supported by at least one member of the present Board of Regents, and probably also by many other fellow-citizens.

OUR PRESENT PRESSING NEED.

It is no longer disputed that the agricultural element of a community is its most valuable asset. It is *the* element that makes for civic virtue and prosperity. The greater the number of intelligent, enlightened individuals constituting a community, the richer, the more intelligent is that community. And the average farmer in the United States of today is an intelligent man. He is a man versed in many of the sciences pertaining to his vocation, and is an intelligent citizen besides. Farming today is no longer mere manual labor. The farmer now is a practitioner of the natural sciences and a business man. The educational work of the U. S. Department of Agricultural and the State experiment stations and agricultural colleges during the past generation was not in vain. Close inquiry will reveal that the mainspring of wealth of the United States during the past decade have been and still are the bumper crops produced by the farmers year after year with increasing celerity.

Our climate, our vast areas of unsettled, productive lands, the nature and quantity of crops this land is capable of yielding under proper management, and the vast market at our very door cry to high heaven for settlers, for cultivators, for farmers. But thus far the cry was vain. Our large and profitable sugar industry is merely an indication of what could be accomplished here in agri-

culture if intelligently pursued. We have waited and waited in vain for settlers to come to us from other shores. The few that came prospered, but their number is limited. And the attraction to others must be equally limited at least as compared with others elsewhere or they would have sought our shores more freely.

From among ourselves we had not the opportunity hitherto to produce farmers. Farmers I mean in the modern sense of a farmer. The farmer that pursues methods of a generation ago is a failure even in America, the land of highly intensive cultivation and enormous yields. None but similar results could be expected from old-fogy-method farmers here. The Californians that came succeeded because they had the experience of years to back them. They could not but succeed. Their experience too was gathered in a state where modern methods of cultivation, irrigation, cropping, and marketing prevail. Failure for them was practically impossible.

But if we can not lure more of this kind from the mainland we need not despair. We have in our midst a population that for generations did business with mother earth. A people of the land and for the land even here. A people that has served its apprenticeship in our fields. A people that has learned to love and cherish this land, to regard it as home, and will be satisfied with no other land for home. Watch them flock back from California whither they were lured for a while by the gold brick of high wages. Why do they so eagerly return to the islands? Because this is their home. Their relatives, associates, friends—all are here. They love Hawaii, its hills, its valleys, its air, its water, its soil.

I refer here particularly to the Portuguese. But is there any reason why this does not apply to all Hawaiian-born persons, be they natives, whites, Portuguese, or a mixture of them all? Even transients are charmed by the country. Those that tarry here a year or two are irresistibly drawn to our shores when they leave them. Our attention, therefore, should be directed towards developing our internal resources. We should strive to anchor our own people, our own candidates to the soil. We have the soil, we have the people and all other requirements, and need but weld them together to create the coveted farming element.

Until now our provisions for making farmers, for attaching the floating population to the land were inadequate. To offer land is not sufficient. Man upon land without tools is a sorry sight. But

the main implement of the farmer of the day, is a knowledge of at least the rudiments of the science of agriculture, and this implement we had no means of providing. Moreover, few men will at a mature age undertake to acquire the necessary book knowledge to guide them in their pursuit, and book information is but the gear by the aid of which one is enabled to steer clear of error. Any quantity of bulletins will not create a farming population where there is none. These are intended to help those that are already tillers of the soil. We must catch the youth that is agriculturally inclined and mold it into condition to manipulate the land successfully. Youth so inclined, and so trained is inexorably bound to the soil, and other conditions not being adverse, is bound to make a success of farming. Gradually we may hope thus to build up a farming population from within rather than wait for possible settlers from without. Around this class as a nucleus a desirable community is built up. Their success will be the magnet to attract others from without.

Moreover, young men equipped with the necessary knowledge for agricultural work, will find the means of opening up land tracts now closed, and overcoming obstacles in transportation and marketing. Given a farming population and we can depend upon it that the incidental problems will be solved.

As a parallel to the reasons advanced for aiming at converting our own growing generation into agriculturists one may cite our Normal School, as a case in point. Were we dependent upon mainland teachers our supply would never answer our needs. By preparing our own teaching staff we are provided with a body of teachers that can be depended upon to stay with us. So also to populate our soil we will act wisely to draw upon our own sons and daughters. Once settled they will be certain to stay with us and help us build the state to which we so fondly look forward.

WHAT THE COLLEGE CAN DO.

To meet this urgent need our last Legislature has wisely made provision for a college of agriculture. But much of the work of building up a farming community from within will depend, I believe, upon the nature of agricultural course the college will provide. It is doubtless flattering to any community to be in a position to provide higher education, be it technical or other. We could model our college after California or similar state colleges. The graduates of this college would doubtless make excellent

professors or specialists for our own and other colleges or experiment stations. In other words by giving our Agricultural graduates a technical education in tropical agriculture we will glory in supplying the tropical world with experts and teachers. We will teach the tropical world how to take best advantage of its agricultural fields. But what of ourselves? What material advantage will accrue to these islands from such a course? Glory galore and little else!

No one than the writer favors higher education more. But he is aware at the same time that higher education is a luxury we can not afford. If a young person is apt, so inclined, and has the means, he could be provided with a post graduate course in any specialty that he may desire and then proceed into the teaching or investigating fields. Similar facilities may be provided students outside of the Territory should they seek our institution for special knowledge in tropical agriculture. But our aim for our own salvation and the redemption of our uninhabited soil should be to convert our main body of agricultural students into men and women willing, eager to and capable of settling on the land and till it for a livelihood. If we fail to attain this end, our college, so far as the good of this land is concerned, is a failure. Our community is essentially agricultural so that the other courses are a negligible quantity, notwithstanding the possibility that the agricultural course may be the least attended. The latter fact also will depend upon the relative sentiment for agriculture that will be inaugurated in the college.

The work of our agricultural college ought, in the opinion of the writer, to be along four lines. First, the main body of the course should be outlined with the single view in mind of making intelligent farmers out of those pursuing it. Practical or field work should be amply provided for, the class room work serving as the handmaiden of the other.

Secondly, provision should be made for short, special courses in various branches of agriculture for the accommodation of those who can not afford either the money or time for a full course.

Thirdly, a course in agriculture and natural sciences should be arranged for our teachers, both present and prospective, the pursuance of which should constitute part of the Normal School curriculum and obligatory to the students thereof.

Fourthly, provision should be made for post graduate work for those seeking higher degrees in tropical agriculture.

THE FEDERAL LAWS RELATING TO STATE COLLEGES OF AGRICULTURE.

In order to establish our college on a firm basis we are obliged to accept the Federal grant toward the maintenance of such an institution and must, therefore, comply with its requirements. The Congressional act of 1862 establishing the so-called "Land grant Colleges," in section 4, reads, ". . . the moneys . . . shall be inviolably appropriated . . . to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislature of the States may respectively prescribe, in order to promote the liberal and *practical* (the italics are mine) education of the industrial classes in the several pursuits and professions in life."

Section 1 of the 1890 Act for the further endowment of Agricultural Colleges, the so-called "Second Morrill Act" reads in part, ". . . twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their *applications in the industries of life* (italics mine) and to the facilities of such instruction."

Finally the "Nelson Amendment" to the "Adams Act" of 1906 reads in part, ". . . the annual sum to be paid thereafter to each State and Territory shall be fifty thousand dollars, to be applied only for the purposes of the agricultural colleges as defined and limited" in the previous two acts.

So far as can be seen therefore the various acts of Congress do not limit the appropriations to higher institutions of learning, nor are colleges defined as such specially. As to precedents of practical schools of agriculture supported by these Federal funds one needs but look at Kansas, so ably represented by Miss Reed at the last Farmers' Institute meeting, Illinois, Connecticut, and many others.

BEES AND LANTANA.

The Lantana is included in a list of West India bee plants, although in these islands bees do not appear to make use of this source of honey supply.

FOOD INSPECTION DECISIONS.

The following Food Inspection Decisions are contained in a recent publication of the Bureau of Chemistry, U. S. Department of Agriculture. They are of sufficient interest to be reprinted in full:

THE USE OF SUGAR IN CANNED FOODS.

Numerous inquiries have been addressed to the Department respecting the proper labeling of canned fruits and vegetables to which sugar has been added. Sugar is a wholesome food product, and is also condimental. It reveals its own presence by its taste. Its addition to a food product can not be objected to on the ground of injury to health.

It is held by this Department that sugar can be used in the preparation of all food products where it is not used for fraudulent purposes. If sugar be added without notice to Indian corn which is not sweet, for the purpose of making it appear a sweet corn, to be sold as such, it is used for a fraudulent purpose, and for this reason is prohibited by the law.

In section 7 of the law it is provided that a food is adulterated "if it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed." It is evident, therefore, that a food product can not be mixed with any other substance for the purpose of concealing damage or inferiority. A vegetable which is not naturally sweet could not be sold as one which is naturally sweet by mixing with sugar without violation of the law, unless the addition of sugar is plainly indicated on the label.

The addition of sugar to canned vegetables is not for preservative purposes. Added sugar increases the tendency to fermentation. It is added wholly as a condimental ingredient.

It is held, therefore, that the addition of sugar to a substance not naturally sweet, converting it into a substance which might seem naturally sweet, is justified if the label plainly indicates that this sweetening material is added. In other cases, where no deception is practiced, the mention of the presence of sugar is not required.

The term "sugar," as used herein, is confined to sucrose (saccharose), either in a solid form or in solution.

POLISHING AND COATING RICE.

It has been represented to the Department that it is a very common practice in this country in the preparation of rice for commerce to treat it in the following manner:

1. The rough rice is passed through a set of stones, or shellers, which removes the hull.

2. The product is subjected to a series of scouring machines by which the bran and cuticle are removed.

3. The rice is passed through a machine that is known as the brush, which removes a portion of the flour, or more commonly known as polish.

4. The rice is introduced into a warm revolving drum or cylinder holding often as much as 4,000 pounds, and glucose and talc are added in the following manner and in about the following proportion: As the rice is fed into the drums a small proportion of glucose and talc is applied, namely, glucose one one thousandth and talc one three-thousandth part of the whole. The object of the glucose is to form a coating by means of which a part of the talc is held on the surface of the rice.

It is stated that the rice is coated for the following reasons:

1. The coating makes the rice less susceptible to dust and other foreign matter during transportation and storage.

2. It is, in a measure, a preventive against the attack of the weevils and worms which are so destructive in warm climates.

It has also been represented that in some instances paraffin is used instead of glucose and that rice starch is sometimes used in place of talc for the purpose of finishing rice according to the method described above.

In submitting these representations it has been asked if the process above described is permitted under the food and drugs act of June 30, 1906. It is not clear to the Department that coating rice in this way protects it in any manner from dust. Evidence of an expert character is also on file in the Department showing that unpolished rice is no more subject to the ravages of the weevil than the polished article.

It is the opinion of the Department that no coating of any kind can be used in the manner indicated if the product "be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed." In each case whether or not such a result be secured is a question of fact to be decided by the evidence.

It is held by the Department that rice treated in the manner indicated above with glucose and starch should be labeled in all cases with the name of the extraneous substances, as

"COATED WITH GLUCOSE AND STARCH."

In such declarations all of the food substances used for coating should be mentioned. Any coloring matter or other substances that may be employed to change the tint of the rice should be declared on the label.

The question of the wholesomeness of paraffin, talc, or other non-food substances used is to be construed in such a way as to protect the health of those most susceptible to their influences. Rice is a diet often prescribed for those suffering from impaired digestion. The use of paraffin in such cases is at least of questionable propriety, and in the opinion of the Department it should be excluded from food products. Under the fifth provision of foods, section 7 of the food and drugs act, June 30, 1906, and under Regulation 14 the use of talc is permitted, provided that each package be plainly labeled with the name of this preservative and the proper directions for removal be given.

THE PRICE OF AWA ROOT.

In answer to a correspondent, we have ascertained that the present market value of awa root in London is about eleven or twelve cents per pound. The demand for the article is, however, limited. This information affords an interesting comment upon the little profit to be expected from the collection of awa, numerous references to which have lately been made in the local press.

REVIEW OF ENTOMOLOGICAL LITERATURE.

 BY JACOB KOTINSKY.

"The Sugar Cane Leaf-Roller (*Omiodes accepta*) with an Account of Allied Species and Natural Enemies." By Otto H. Swezey. Bull. V, Division Entomology, H. S. P. A. Experiment Station. 8°, 61 pp., VI pls., 3 text figs.

To the habitual reader of entomological literature a paper by Mr. Swezey is always a treat. It is always replete with useful and interesting information, systematically arranged and readable alike to the veteran and novice. The present bulletin, because it treats of insects affecting sugar cane, was written primarily for the growers of that plant. But it contains also so much information on insects affecting other plants, especially our notorious cocoanut leaf-roller, that it is well worth the perusal of many of us. Besides, the sugar cane leaf-roller feeds on grasses also.

In this bulletin the author describes, figures and gives the life histories of all (15) Hawaiian species of the genus *Omiodes*. "They are all native to the Hawaiian Islands and occur nowhere else," he tells us. One of these (*O. meyricki*) he describes as new to science. The tables for the determination of adults and caterpillars and their parasites will prove extremely useful to the future student of these insects.

A brief chapter is devoted to remedies, and it is interesting to note that this is followed by one of 20 pages and 2 plates on natural enemies wherein descriptions, habits and figures of 15 species of parasites and predators are given. In the introductory paragraph the author says: (p. 37) "Since so many (of the pests) are killed by parasites, and yet there are enough left to do considerable injury at times, one can not help but wonder to what extent these pests might increase were there no parasites preying on them, and how many times more serious would be the damage done by them. The extreme difficulty and impracticability of treating sugar cane fields, or large palm trees, artificially, for the destruction of these pests, makes it all the more important that there are so many valuable parasites preying upon them; and shows the value of introducing natural enemies to control a pest, for the four best parasites of these leaf-rollers are introduced species . . . ", of these 4 species 3 are definitely known to have been

introduced by Mr. Koebele. Thus after 14 years of incessant labor in introducing useful insects to these islands Mr. Koebele's efforts are gaining scientific recognition, and the government of these islands deserves credit for the wisdom of securing his services and retaining them all these years.

To those of us who are accustomed to receive all the State bulletins gratis, and who are familiar with the prices charged for bulletins by the Superintendent of Documents at Washington the price set for Mr. Swezey's bulletin is rather high. Unless special inducements are offered to islanders it is hard to see *how* many copies will get into their hands. That it would be desirable for all concerned is beyond question.

GROWING BULBS IN WATER.

One of the most artistic and inexpensive methods of cultivating blooming plants for home use is to grow bulbs in water. The Chinese are expert in this work and at their New Year festival the streets of Honolulu show a profusion of their sacred lily in full bloom. Very many varieties of flowering bulbs may be successfully grown in water and it is surprising that this easy method of producing handsome blossoms should have been allowed to remain so long neglected.

In selecting bulbs for this purpose, large heavy ones should be chosen. In many cities glasses are made especially for the purpose of growing the handsome flowers of the hyacinth, but any open bowl or vase can be used for these and other bulbs.

If grown in an open bowl, the bulbs selected for blooming should be supported with a sufficient quantity of clean small stones or pebbles to allow the developed plants to retain their upright position. Water should then be poured over the stones until it reaches the base of the bulbs. The bowl should now be kept in a cool dark place until the roots have attained a good growth, care being taken to replace the water as it diminishes. When the bulbs are required to bloom, the bowl should be removed into a light warm atmosphere, when spikes of blossoms will soon be thrown up.

Besides the Chinese sacred lily or narcissus, many other bulbs can be made to produce blossom in this manner. Among these hyacinths, jonquils and crocuses have all produced satisfactory results.

IMPROVING HAWAIIAN PASTURES.

BY G. C. MUNRO.

(Continued from the August Forester.)

Chloris gayana: Rhodes Grass. Though of much later introduction this grass I believe will prove as valuable as, or perhaps even more valuable than *Paspalum dilatatum*, though in a different way. Mr. A. W. Carter, when agent for the Molokai Ranch, found notice of it in an Australian publication, to which country it had been sent from South Africa by the late Cecil Rhodes. Mr. Carter secured a small package of about two ounces of seed in 1904 and it was sown in November of that year. From that packet were saved two gunny sacks of seed, and a nice little rick of hay was cut in May. In 1906, from the old roots, 10 bags of seed were saved. Now, in March of 1907, there are about 30 acres of it to be cut for hay, and the young grass is growing thickly wherever it seeded last year. It is as a hay grass that this grass will be especially valuable, as it grows with great rapidity and forms a dense stand up to 5 feet high when in seed. It has the advantage of being green and in flower after the dry season has set in and when the weather is favorable for curing hay on the dry ranches. This was my experience of it in 1905 and 1906 on cultivated land, but whether on old land it would keep as green remains to be proved. It is a great drought resister and though I have seen some large plants in their second year killed by drought, yet on cultivated land it grew and flowered right through the excessively dry season of 1906. This may, of course, be due to some extent to a system of dry farming, by a number of chickens scratching for seed and keeping the surface loose, thus conserving the moisture below.

The seed was first allowed to ripen and the seed heads reaped. The paddock was then mowed for hay, and though not an ideal way of hay-making yet the hay was relished and soon eaten by the stock in the dry season. It has yet to be shown whether it will furnish hay in quantity from old fields, at what time it should be shut off for this purpose, and also what amount of grazing it will stand in the pastures. I feel sure that with this grass some of the dry ranches here could not only put up a reserve supply of hay for the dry seasons and periods of drought for their stock,

but also could supply all the hay needed for the plantations and thus stop a source of weed supply to these Islands.

Rhodes grass seeds very heavily and to some extent continuously throughout the year. The main crop ripens about May and June, but it still continues to flower. The seed germinates very readily and the young plants stand a great amount of dry weather whilst young. It will not stand much stocking in its first stages. Horses and sheep are especially hard on it, as they pull off the long runners which are a characteristic of this grass, before they get properly rooted and bite off the whole top of the plant. Some roots planted in a mass of honohono and not under stock grew into strong bunches laden with seed and promised to entirely get the better of the other plant.

I feel sure that with *Paspalum dilatatum* on the uplands, and Rhodes grass hay grown on the drier country and fed to stock with kiawe beans, the markets here will eventually be supplied with prime beef and mutton at all seasons of the year, instead of the present condition of all the ranches having their stock fat at the same time.

It will be found best, I think, in cultivating this grass for hay to plow and cultivate the fields and sow the seed, as then the fields will be levelled and ilima and other shrubs got out. It seeds so enormously that a very small amount of seed only is necessary for a start and this can easily be obtained here from ranchers growing it, or from Australia. The introduction of *Chloris gayana* and of *Paspalum dilatatum* alone, were worth all the expense, effort and disappointments in the experiments connected with the introduction of new grasses on Molokai.

Astrebla pectinata: Mitchell grass. This is one of the best of the Australian native grasses, where it is prized as a fattening grass even when dry, and it is also cut for hay. Mr. A. W. Carter introduced this grass here and I have found it in its second year of growth probably the best drought resisting grass we had on the ranch; I could not find a single plant killed by the drought of 1906, and though the leafage dried up, even those stems that had shed seed remained green, and it was like self-cured standing hay. It would therefore be an invaluable grass to have over the pastures, but the difficulty will be to establish it. The planting I refer to was plowed and prepared land kept clear of stock. Its growth there was not rapid, and it did not seed heavily. I have not results from scattered seed, though these may show up later.

I believe, however, that it would pay to establish a paddock of this grass and to give it a good trial in the interests of the very dry country.

GRASSES FOR THE MIDDLE COUNTRY BORDERING ON THE DRY LANDS.

Danthonia: New Zealand oat grass. I sowed *Danthonia semi-annualaris* in the first months of 1901 and patches of it are to be found on various sections and it seems to be spreading. *Danthonia pilosa*, which is the better grass of the two, was sown in 1904 and it has made a good showing, growing quickly, seeding freely and keeping alive on very dry country through the drought of 1906. In fact it stood the drought as well as *Paspalum dilatatum*.

These *Danthonias*, natives of New Zealand, have come much into prominence there in the last few years and I was astonished to see on my recent visit, second class land where the better grasses could not be got to make a good growth, carrying a splendid stand of these grasses. This was accomplished by judicious stocking and careful use of fire. At certain seasons the *Danthonias* carry fire readily, and they grow and spread more rapidly when burnt. The firing of the land is also a great preventive of intestinal worms that are so troublesome in sheep and horses.

The *Danthonias* are working wonders on the second and third class land in New Zealand and I am sure would do a great deal for the pastures here, if sown at 800 feet elevation and upwards, where there is not too heavy a growth of the coarse grasses. The seed heads when ripening have a high feeding value and sheep and horses will go over and pick them off and fatten. I saw beautiful lambs raised on *Danthonia* pasture and the wool from grown sheep on lands under these grasses fetched a high price, perhaps on account of the habit of the grass to grow throughout the year.

Eragrostis brozenci, another Australian grass, fills a place on the poorer land, but though it is still growing here from sowings I made in 1901 it has not spread to any appreciable extent.

Bromus unioloides: Rescue grass, is one that has shown itself well adapted to the uplands and regions bordering on the dry country, in which latter place it only grows as an annual. As I remember it in New Zealand it would not stand heavy stocking

but cut well as a fodder. It is at present popular in Australia as a drought resisting pasture grass and stands stocking with care.

Sporobolus indicus: Smut or Rat-tail grass, also thrives on the same class of country and stands more drought than the other. In my early days in New Zealand I remember this grass having full possession of large tracts of second class land. It was improved by annual burning. The chief objection to it was its toughness, which was hard on the animals' teeth. On my recent visit I found it had largely died out, giving place to the *Danthonias*, and other grasses. Mr. Jared Smith informs me that it is a native of these Islands.

Bromus inermis: Smooth or Hungarian brome, which has been confounded to some extent here with Rescue grass, I had little success with.

Tricholaena rosea: Natal red-top, is a useful grass growing luxuriantly and seeding heavily in the early part and at the end of the wet season. It stands drought fairly well, but heavy stocking is hard on it.

Stenotaphrum americanum: Buffalo grass, has been in the country for a long time, and has not been given the attention it deserves. I have lately seen some fine fields of it on Mr. G. N. Wilcox's place at Lihue, Kauai. It was planted at intervals on plowed land and quickly covered the surface, and is greedily eaten by the stock. I have seen patches of it on Molokai that were gradually crowding out the thicket manienie. This grass is a favorite in the warm parts of Australia and resists drought fairly well.

Opuntia Tuna. When Luther Burbank accomplishes the full evolution of his spineless cactus, or the Hawaiian ranchers work up the one they have here, there will be another valuable stock food for the dry season. Paddocks of this could be grown in the vicinity of the kiawe forest, and the fattening stock changed from one to another.

GRASSES AND FODDERS FOR IRRIGATION PURPOSES.

Alfalfa. I perhaps need hardly say that this fodder has done phenomenally well under irrigation on rich land. Mr. D. P. R. Isenberg, at Waiulae, has raised a great many crops a year from

it. I tried it on open country with little success, and also Japan clover. The latter only growing one year.

Panicum mollé: Para grass, or panicum grass. This was introduced by Mr. Albert Koebele from Fiji in 1902 and was very soon distributed over the islands. It is a good pasture grass and a good drought resister, but it does not seed well under grazing and the runners are too slow in taking hold of the ground for it to spread in the pasture. It is useful to cut as fodder, making a very rapid growth. It is unfortunate that this grass has become generally known here as "panicum," there being so many species of panicum.

Panicum maximum: Guinea grass. This is also a useful grass to grow under irrigation and liberal fertilizing, as a feed crop to be cut and fed to the stock. It grows with great luxuriance under these conditions, but does not stand heavy stocking in the pasture.

GRASSES AND FODDER PLANTS FOR HIGH LANDS.

Dactylis glomerata: Orchard grass or cocksfoot. *Lolium perenne*: perennial rye grass. *Holcus lanatus*, mesquite, velvet grass, or Yorkshire fog. These three important grasses were first tried on the Molokai ranch in 1901, though their record on the Islands dates much further back. If not over-stocked these grasses will spread and take up new land on the mountain moist country and I believe have made an even better showing on the other Islands. I saw as fine a field of rye grass on the Parker ranch as I have seen in New Zealand. Orchard grass grows well and seems to spread and will stand more drought than rye-grass, but is coarser and not of so much value as a fattening grass.

Fog or Mesquite, as it is known here, is a very persistent grower and spreader in the wet country and I believe has proved a good pasture grass on some of the Maui and Hawaii mountain ranches. It is thought little of in most parts of New Zealand, but I believe in parts of France it is valued and constitutes the bulk of the pasture in places. No one with mountain ranches can make a mistake in sowing these three grasses.

Anthoxanthum odoratum: Smut vernal. This makes a wonderfully strong and early growth on the wet regions on Molokai. In other countries it is not considered amongst the finest of

grasses, yet from its habit of growing on the poorest land and the fact that it grows extra strongly here it may fill a place on mountain pastures.

Poa pratensis: Kentucky blue grass. *Poa annua*: Annual meadow grass. Are both worthy of being included in upland mixtures. They have done well on these Islands.

Festuca elatior: Tall fescue. I sowed this grass in 1901 and it made a strong growth on the mountain, I obtained the seed as Chewings fescue, a New Zealand hybrid, and was only undeceived on my last visit to New Zealand where I found Chewings fescue a much finer and shorter grass, and tall fescue not usually a popular grass on account of its very rank growth on wet land and its tendency to develop ergot. I have since seen it strongly condemned.

Agrostis alba: Red top. This is a fine grass and has done well on the moist country; I found it very much in evidence in the pastures in New Zealand.

I had little success with clovers. Crimson and red clovers seeded but died out, and alsike and trefoil were alike unsuccessful. Mr. Louis von Tempsky successfully established white clover on Maui, having sown it with a number of others some 20 years ago. I grew some plants of tree lucerne, a bushy shrub growing about 10 or 12 feet high. It seeded but sparingly and eventually the trees died. Whether it would be worth planting or not I do not know.

Timothy was an entire failure in all my trials.

CULTIVATED FEED CROPS.

Whether it will pay to cultivate land and grow catch crops may be somewhat doubtful, unless under a system of dry culture, by sowing the seed with the last heavy rains and having the crop growing in the dry season.

I sowed about 10 acres of dwarf Essex rape in November, 1905, having tried a small patch the year before. Though much too thickly sown and attacked by cut-worms and aphides, in seven weeks it was high enough almost to hide the four months old lambs I had in it. These lambs thrived splendidly and never missed their mothers, till by excessive dry weather in January and February the rape all wilted up. It sprouted again with the March rains when it was cut and fed to the hogs. Having sown

Rhodes grass with it and finding the lambs too hard on it whilst young, I did not put them in again. If the rape had been alone and the harrows had been run over it when wilting it might have revived it as the lambs trod the surface smooth and the moisture was thus more readily lost.

"Thousand headed kale" is grown for the same purpose as rape and resists the drought better and would probably do better here. Rape is considered the best fattening food for lambs and is very much grown for this purpose in the colonies in finishing fat lambs. My object in planting it was to try and to keep the Honolulu market regularly supplied with fat lamb. It is also good food for almost any farm animals. From one to seven pounds of seed should be sown to the acre. I think there is a great field here for experiment with crops of this kind such as field peas, carrots, turnips, Egyptian and Kaffir corn, soy beans, etc., etc.

I sowed about half an acre of cow pumpkins and they struggled hard against the drought, but only a small crop was harvested. They are also very good food for any farm animals, and useful as a vermifuge. If crops of these kinds can be grown and the plow kept more at work it will serve to minimize the plagues of internal worms that at times visit the horse and sheep ranches.

In dividing these grasses and plants into mountain, middle, and dry country, there can be no hard and fast line. Some will have a range from the frost line to the very dry country as *Paspalum dilatatum* and Rhodes grass, and most of the middle grass will eventually spread to some extent into the dry country and the mountain grasses into the middle lands.

I think it better to start the dry country plants, except those preferring salty land, on the borders between the middle and the dry country as they will then spread on to the dry country. I would also advocate, as is practiced in some parts of Australia, to plow and sow the seed in long narrow fenced strips of land on the boundaries of pastures and at right angles to the prevailing winds. In this way there will be a chance of the grasses becoming established in the adjoining pastures. Sowing seed on the very dry country is almost useless unless one has quantities of it.

The middle land grasses can be sown on the surface fairly high up on the middle country, but not in the thick pilipili-ula and manienie. The wet country grasses can also be surface sown and will take well if the other growth is not too thick.

A great deal has been done in establishing mountain grasses in the past. Mention was made of this fact at the Stock Breeders' meeting in 1903, by Mr. L. A. Thurston. Mr. Jared G. Smith also mentions that he found a large number of foreign grasses on his travels over the islands.

With the dry country the proposition is a much more difficult one, but I have no doubt that in the future there will be as great and probably a greater development in these lands as there has been on the wet lands in the past.

I have not enumerated the grasses which I failed to grow, as other trials under different conditions and soils might be successful. I think that experiments should be conducted on every ranch, not necessarily to go to any great expense. A good fodder plant may be discovered now and again that would be of immense value to Hawaiian ranchers.

LOCAL NOTES.

Dr. Duerden, formerly Curator of the Museum in Jamaica, who spent the summer of 1906 in the Hawaiian Islands studying the marine fauna, is at work arranging an agricultural course for the Rhodes University College, South Africa, where he is now Professor of Zoölogy.

The Hawaiian Planting Company, Limited, of Hilo, has recently filed its articles of incorporation. The new company is organized to plant, grow and raise fruits, and to manufacture, distil and prepare products of the soil into commercial and trade articles. The capital stock is \$4,000, divided into 800 shares of \$5 each. Its officers are: John K. Kai, president; J. K. Keliikahi, vice-president; C. K. McGuire, secretary-treasurer; A. K. Hapai, auditor, and P. A. Victor, T. K. Lalakea and Charles Williams, directors.

The output of the Hawaiian Pineapple Company's cannery at Iwilei, Honolulu, for the past season amounts to two and a quarter million cans. The cannery at Iwilei is the largest in the world, which is the more extraordinary in view of the comparatively recent establishment of the company. Already plans are being drawn up to double the present capacity of the machinery.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY.

PRINCIPAL CITRUS INSECTS IN HAWAII.

BY JACOB KOTINSKY.

(Continued from May "Forester.")

"SNOW SCALE" OR "ORANGE CHIONASPIS."

(That is Chionaspis citri Comst.)

This species of scale bug has not hitherto been recorded from these islands. It was found in but one garden in Honolulu, but its identity is unmistakable and because of its destructiveness to citrus trees in Florida and elsewhere, attention is here called to its appearance.

The female scale.—To the ordinary eye this looks so very much like the purple scale as to be indistinguishable. But it is thinner, considerably broader in proportion to its length and is distinctly ridged along the entire length. In other respects it is quite similar to the purple scale. The presence of this insect upon a citrus tree is, however, readily recognized by the

Male scale.—This is snow white, and as it usually occurs in large numbers, gives the infested tree a rather striking appearance—as if it were white-washed—hence the "snow scale." We have other "snow scales" in Hawaii but none of them were so far observed on citrus plants.

In habits and behavior it is so much like the purple scale that it is unnecessary to dilate here. This applies also to the remedies prescribed for the purple scale—they are equally effective against the orange chionaspis.

FLORIDA RED SCALE (*Chrysomphalus aonidum* L.)

This scale insect is very common on all the islands on a larger number of plants, including the citrus group. It is seldom numerous enough to do serious injury, but is frequently sufficiently numerous to attract attention. Being almost perfectly

circular in outline and dark in color it is strongly contrasted by the green background of the plants it inhabits, and made conspicuous in consequence. The younger stages and particularly the male scales are frequently found perforated near the center, indicating the exit of a parasite, which probably prevents the scale from becoming unduly numerous. The common name does not indicate its origin for, as a matter of fact it is of world-wide distribution. It flourishes most in damp atmospheres, hence its abundance in Florida, Louisiana, and on plants confined in green-houses. Its native home is at present unknown and it is doubtful whether it will ever be discovered.

The female scale.—The substances composing this scale are identical with those of the purple scale, though it is less thick, circular in outline and the molts lie in or quite near the center. It is dark brown in color, almost black, the central portion being lighter and bearing a nipple-like appearance. When the scale is raised by means of a pen knife or other fine point the wingless, lemon-yellow insect sometimes surrounded by eggs, empty egg shells, or crawling young, remains attached to the host.

The male scale is almost exactly like that of the female in structure, but is much smaller, somewhat elongate, and bears but one molt near the center.

The female always remains adhering to the host when the scale is raised and is seen to be a yellow, shiny, legless, wingless, semi-globular sack, held fast to the host by the long threads that constitute its proboscis or beak.

The male differs little from most of the males of this group in either development or appearance.

MEDITERRANEAN SCALE (*Parlatoria ziziphus* Lucas.)

This is the small black scale usually occurring in large colonies upon leaves, fruit and stem of citrus plants on these islands, especially on what is known here as the "Chinese orange." On no other variety of the citrus group can it be regarded as a serious pest.

The female scale is flat, elongate, and composed almost entirely of the black, rectangular second molt. The first molt lies in front of this, overlapping it about half of its own length, and is also opaque black.

The male scale is also elongate, yellow or brown in color except the single molt skin which is black.

This insect is common on citrus plants and fruit in the countries bordering on the Mediterranean sea, whence it is supposed to have been distributed to other citrus growing countries in the world. It is also common in the Orient whence it must have reached these islands. Now that the importation of citrus fruits from the Orient into these islands is prohibited, very little of the pest reaches this country, and none alive, since all infested fruits and plants are either fumigated, destroyed or returned.

NOTES.

The price of camphor is at present remarkably high, and a great extension of the planting of camphor trees is already in progress in Ceylon and other countries.

The artificial production of camphor has been rendered remunerative by the present price of the natural drug. A fall in the market would render the synthetic manufacture unprofitable.

The exports of rubber from Trinidad are rapidly increasing. The prices obtained for Castilloa sheets average nearly one dollar per pound.

A rubber producing tuber has recently been discovered in Portugal West Africa. The tuber is turnip shaped and yields its lac upon compression. Coagulation is produced by means of alcohol. It is said that 180 pounds of rubber per acre can be produced from this new source in two years.

The unprecedented coffee harvest in Brazil this season has rendered it necessary to withhold a proportion of the crops from the market in order not to cause the ruin of many planters.

The export of ostrich plumes from South Africa is valued at about seven million dollars per annum.

RECENT PUBLICATIONS.

THE OPEN-TANK METHOD FOR THE TREATMENT OF TIMBER.

A marked saving in three directions—cost of equipment, of materials and labor, and of transportation—is being effected by the introduction of what is known as the “open-tank” method of treating timber. The general practice of preserving timber has hitherto been retarded by the heavy cost of closed retorts and other complicated equipment ordinarily used and the need of experienced men to operate them. Not until the kinds of timber long used and considered almost indispensable for certain purposes grew scarce and rose alarmingly in price did wood users consider seriously the possibility of consuming less wood by making it last longer.

As a rule preserving plants have been located at lumber centers, where a large business might be expected, and it has often been necessary to pay transportation charges to and from the treating plant on timber needed for local uses, such as for ties, posts and poles. The equipment of the open-tank method, which consists of an open tank, capable of withstanding heat and either equipped with steam coils or so arranged that fire can be placed underneath, is so simple and comparatively so cheap that it is within reach of the smaller companies, contractors and farmers. The fact that it is portable gives it a distinctive value, since it can be taken, if necessary, into the heart of the forest, and even into the mountains.

One of the chief advantages of the open-tank process is that it can be effectively applied to parts of timbers which are especially subject to rapid decay, such as the butts of fence posts and telephone poles, without wasting preservatives on other parts. It is also especially adapted to the treatment of mine props, small dimension timbers, cross-ties, piling, and shingles, and timbers in small sizes of loblolly pine, black and tupelo gum, western yellow pine, and lodgepole pine, and similar kinds of wood. Fairly good results have been obtained in the treatment of arborvitæ, chestnut, and red oak, but the experiments thus far do not warrant the application of the method to the treatment of piling and ties made of these woods.

The open-tank treatment is being rapidly developed, and while it ordinarily does not secure so deep a penetration of the chemicals as the retorts it is sufficiently thorough to protect timber

for practical purposes in many situations, and it is probable that future experiments will further extend its application.

Circular 101, just issued by the Forest Service, United States Department of Agriculture, describes and illustrates the open-tank equipment. It can be had upon application to the Forester, United States Department of Agriculture.

SUGGESTIONS FOR FOREST PLANTING ON THE SEMIARID PLAINS.

The Forest Service has just issued a circular devoted to the interests of forest planters in the western portions of Kansas, Nebraska, and Oklahoma, northwestern Texas, eastern Colorado, and New Mexico.

This entire region is practically treeless. Here and there, of course, trees have been planted, but forest planting has in no way kept pace with agricultural development. There is real need for forest growth. By careful selection of the species, the choice of suitable sites, and proper management of plantations, enough forest can be grown to exercise a marked effect upon farm development and to supply wood for most domestic purposes. The object of the circular is to show just what it is practicable to undertake in the way of such plantations. Planting may be done for any one of three chief purposes—protection, wood supply and shade.

A windbreak consists of one or two rows of trees planted primarily for the purpose of checking the force of the wind. The term "shelter-belt" is applied to larger groups of trees which form forest conditions and serve a protective purpose. Any species which is adapted to the region may be used for windbreaks. Where evergreens will succeed, however, they are more desirable, since they afford better winter protection than deciduous trees. A windbreak consisting of a single row should be composed of a densely growing species with branches close to the ground.

The main use of windbreaks is to shelter an orchard or a residence site, to prevent hot winds from scorching field crops, and to conserve soil moisture within the protected area. They may also be planted in open pastures for the protection of stock. Incidentally, the windbreak may furnish useful material, but it must be placed where it will afford the most effective protection, without much reference to the character of the soil.

Wherever agriculture is practiced in the plains region, the farmer will find it profitable to devote a few acres of good land to trees. It is true that some time must elapse before the plantation will become productive, but, by the choice of rapid growing species and by close spacing, the thinnings which will be necessary in a few years will provide material suitable for fuel, stakes and the like.

The choice of species for this purpose is naturally very limited and will depend somewhat on the location. Trees that grow rapidly and at the same time produce wood of good quality are best. If they also sprout from the stumps, the forest may be made permanent with a little care.

The pamphlet contains suggestions as to the choice of species, with notes on their requirements, and directions for planting and care. It constitutes Circular 99 of the Forest Service and may be obtained of the Forester, U. S. Department of Agriculture.

YEARBOOK OF THE U. S. DEPARTMENT OF AGRICULTURE, 1906.

The Yearbook contains the annual report of the Secretary of Agriculture, 120 pages, and thirty miscellaneous papers, 332 pages, covering a wide variety of subjects thoroughly representative of the varied scientific work conducted by the Department. Also an Appendix, 241 pages, and Index, 26 pages. The Appendix contains lists of names and post-offices of persons prominent in agricultural work in all its branches, including a statement of the Department organization with the names of the persons in charge of the several branches of work. It presents summaries of agricultural observations in several fields of legislation on forestry, roads, and game protection, and a statement on the Federal meat inspection law with a review of the animal industry work, unusually full. It closes with the annual statistical tables covering production and prices of the principal crops and farm animals, and the imports and exports of agricultural products. A new feature is a table of cotton production, domestic consumption, and exports, from 1790 to the present, and of prices from 1869.

FARMERS' BULLETIN 294.

Farm Practice in the Columbia Basin Uplands. By Byron Hunter, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 32, figs. 9.

A description of the uplands of the Columbia Basin, the methods of tillage in use by the farmers of this region with the relative merits of the different methods, and a study of the varieties of wheat grown and their adaptability to the different sections.

FARMERS' BULLETIN 295.

Potatoes and Other Root Crops as Food. By C. F. Langworthy, in Charge of Nutrition Investigations, Office of Experiment Stations. Pp. 47, figs. 4.

A summary of information concerning the composition, digestibility, and nutritive value, etc., of potatoes, artichokes, tropical starch-bearing roots, succulent roots, tubers and bulbs, and roots used as condiments.

FARMERS' BULLETIN 296.

Experiment Station Work, XLI. Compiled from the Publications of the Agricultural Experiment Stations. Contents: Wells and pure water—Phosphates and soil acidity—Pure seed v. poor seed—Disease-resistant clover—Eradication of wild mustard—Sterilization of soils for preventing plant diseases—Seedless tomatoes—Pickling olives and mock olives—Hay box or fireless cooker—Insect enemies of shade trees—Feeding whole grain—Improvement of cattle—Ventilation of stables—Hog cots—Preserving eggs—American Camembert cheese.

FARMERS' BULLETIN 297.

Methods of Destroying Rats. By David E. Lantz, Assistant, Bureau of Biological Survey. Pp. 8, fig. 1.

This bulletin is issued in response to numerous calls for practical methods of destroying rats. It contains descriptions of different methods of poisoning, trapping rats, the use of ferrets and dogs, and fumigation, gives a list of their natural enemies, and suggests means of excluding them from buildings.

FARMERS' BULLETIN 299.

Diversified Farming under the Plantation System. By D. A. Brodie, Assistant Agriculturist, and C. K. McClelland, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 16.

This presents a discussion of the advantages of diversified farming over the one-crop system, with an account of an experiment in diversified farming on a plantation in Louisiana in 1906.

FARMERS' BULLETIN 300.

Some Important Grasses and Forage Plants for the Gulf Coast Region. By S. M. Tracy, Special Agent, Farm Management Investigations, Bureau of Plant Industry. Pp. 15, figs. 5.

This bulletin discusses the use of Mexican clover (purslane), beggar weed, velvet beans, guinea grass, and Para grass as forage plants, and gives directions for handling them.

FARMERS' BULLETIN 301.

Home-grown Tea. By George F. Mitchell, Scientific Assistant in Tea Culture Investigations, Bureau of Plant Industry. Pp. 16, figs. 4.

Directions for soil selection, planting, cultivating, picking, and curing of tea for home use, with suggestions on preparation for the table.

The above Bulletins may be obtained free by application to the Secretary of Agriculture.

BULLETIN 188, IRRIGATION IN THE YAKIMA VALLEY, WASHINGTON.

This bulletin, by S. O. Jayne, contains a description of the canals used for irrigation in the Yakima Valley, Washington, with statements of cost of construction and operation, methods of construction, methods of using water, and forms of organization for canal companies. It contains, also, data on methods and cost of preparing land for irrigation.

BULLETIN NO. 181, MECHANICAL TESTS OF PUMPING PLANTS IN USE FOR IRRIGATION IN CALIFORNIA.

This bulletin gives results of mechanical tests of a large number of pumping plants in use for irrigation in the vicinity of Pomona, Cal., and of a few of the large plants used for drainage in the Sacramento Valley, California. It contains also statements of fuel consumption and running expenses. It is written by J. N. Le Conte and C. E. Tait.

Application for above bulletins should be made to the Director of the Office of Experiment Stations, Washington, D. C.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 83 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 33 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. IV

OCTOBER, 1907

No. 10

RUBBER CONVENTION.

On Saturday, October 12, the first Rubber Convention ever held upon American soil took place at the Nahiku Rubber Company's plantation on Maui. A representative gathering of those engaged in the new industry was present, as well as a number of the important official and business residents of the Territory.

A specially chartered steamer left Honolulu the previous Friday, carrying about thirty members to the convention. At Lahaina and Kahului others joined the party, which numbered about sixty in all when Nahiku was reached the following morning.

RUBBER TAPPING.

Early in the day Mr. Bradford of the U. S. Experiment Station, gave a practical demonstration of tapping. During the experiment the operator explained the various processes connected with drawing off the latex and its collection and coagulation.

RUBBER ON MAUI.

The cultivation of rubber has been engaging the attention of a small number of growers in the Nahiku district of Maui for some years past, but it was not until 1905 that the first company was formed to devote itself solely to the production of rubber. Other vigorous companies have now entered the field, until now the Nahiku Rubber Company, Hawaiian-American Rubber Company, the Koolau Plantation, and many private growers, among whom Messrs. W. G. Scott and F. Wittrock are prominent, have between them nearly half a million rubber trees in cultivation.

Of these many thousand trees will be ready for tapping early next year, and from that time, rubber will, without doubt, figure more and more prominently in the exports of the Territory.

Although the Hawaiian Islands are theoretically not ideally situated for the growth of rubber, there is now every indication and assurance that they are about to enter the list of rubber-producing countries. The outlook is a most promising one, not only to those immediately concerned in the industry, but to the community at large, for with the successful establishment of this lucrative industry in the islands will come a measure of general prosperity to all. The recent development of the pineapple industry has been both rapid and thorough and the promises for its future enlargement are such that within a very short period the exportation of canned and fresh fruit will be multiplied manifold. Yet, however rapid has been the growth of this industry, the prospects before the cultivation of rubber appear more promising and we predict within a few years the establishment of a number of plantations whose combined capital and influence will be second only to that of the sugar growers.

The first speaker at the convention was Mr. Jared G. Smith of the U. S. Experiment Station, who in part said as follows:

OCCURRENCE OF THE LATEX.

"Rubber, in the condition that it is found in the plant occurs in the tissues. In the Ceara it exists in a network of cells not directly connected. That is, it is the opposite, for instance, to the arrangement of the blood in the human system. If the arm should be cut from a man he would bleed to death, but when you break a branch off a rubber tree the tree does not necessarily die. There is a certain connection, but it is not a close one. If a rubber tree should be cut down you would by no means get all the rubber from it. The latex from only a small area would be withdrawn.

"The rubber in a plant seems to be placed there for the purpose of preventing evaporation of moisture and to stop up wounds which would otherwise cause trouble and possible damage to the tree. There certainly is rubber in many trees in Hawaii and it seems to me that there should be a great deal of success in the growing of rubber trees here.

LOCAL EXPERIMENTS.

"At the Experiment Station we have been making a number of preliminary experiments which we hope will be of use to the rubber growers both here and elsewhere. One of these you have seen this morning in the tapping of trees. There is still a great deal more to be done and we are going ahead with it.

"From what I have seen of the Ceara trees in this country it stands just as well and in some cases far better than anywhere else. The treatment of the trees is a matter which can best be worked out by those actually in charge of the work. The theory is that one should get the most wood that is possible in healthy trees which have, at the same time, been grown in the shortest length of time and at the least expense. That is, the trees should be forced as much as is possible. I repeat that I believe that the best way that this can be determined is through the efforts and observations of those who come in contact with the actual work here on the plantations."

Dr. Waterhouse was now called upon to address the meeting. His paper contained a comprehensive account of the cultivation of rubber and is given here in full:

The general sources of rubber are:

I. WILD RUBBER.

This has been and still is the main source of the world's rubber supply. This rubber comes mainly from the Amazon region, coming chiefly from the species *Hevea Braziliensis*, which, taking its name from the port of Para from which it is shipped, is called "Para Rubber" and is the standard rubber of the world. Also much sapium rubber—an inferior grade—comes from this locality.

The "Ceara" wild rubber comes to the market in the form of scrap, as the bark is shaved off the wild trees and the coagulated latex removed from the sides of the trees. There has been no attempt at collecting the latex from the wild trees, probably from the fact that the latex coagulates so quickly on exposure to air.

Next to South America, Africa produces the largest amount. This is inferior to the South American product and comes chiefly from vines such as the *Landolphias*, and from root rubbers; also from the *Funtunia elastica* and *Kihexia elastica* trees.

Considerable wild rubber comes from Java and India, and from the South Sea Islands, mainly from *Ficus elastica*, or the red rubber of commerce. Also there is wild *Castilloa* from Mexico and Central America. Guyale rubber comes from a shrub growing mainly in Mexico. Contrary to the supposition of many, though this is only a shrub three feet high, it is very slow growing, most of that used at present to manufacture rubber being twenty or thirty years old. From the first year, when only six inches high, it flowers and seeds. Up to the third year it contains no rubber at all, and from the third to the eighth year the percentage of rubber is small and it is only fit for use when eight years old. The quality is inferior. The available supply will only last four or five years and then the supply will be exhausted. It will therefore help to fill the supply until more plantation rubber can take its place.

II. FOREST PLANTED RUBBER.

Rubber planted in the forest to supplant the wild trees and vines of the forest. There is considerable of such planting going on in Africa and there will probably be much more now that the Ryan Syndicate has taken over Congo Free State Concession.

III. PLANTATION RUBBER.

Next comes plantation rubber, which can easily compete as far as the cost of production goes, with the other two classes, and with the increasing knowledge as to its preparation and the consequent increase in the lasting power of the rubber, it is destined eventually to crowd out the other two forms if a low price brings them into a life and death competition.

There are, as is well known, a number of different varieties which are being cultivated in different parts of the world, being mainly the *Hevea* or Para, the Ceara or *Manihot Glaziovji*, the *Castilloa*, and the *Ficus elastica* or Rhambong.

HEVEA BRAZILIENSIS.

Of these the *Hevea Braziliensis* is probably the most important. Its cultivation has been highly successful in Ceylon and the Malay States and it has had far more thought expended on it and its culture has reached a far higher point than that of

any other variety. For the last twenty years or more scientists in the admirably conducted Botanic Gardens of these localities have been putting time and thought on the various problems in regard to the Hevea. This has gone hand in hand with cultivation on a larger and larger scale so that planting, care of the trees, collection of the latex, and the production of rubber, has been reduced to a science; the fact of its increasing yield from year to year in spite of, and even stimulated by, tapping has been demonstrated. Cost of collection, market price, etc., all have been reduced to a business basis; though there are improvements every day.

CEARA.

With the Ceara things are quite different. Ceylon has just awakened to the value of this variety and it is only now that trees are beginning to be tapped that were planted many years ago. Malay peninsula never took up this variety. Central America plantations are just beginning to tap. Hawaii thus has a chance to be in the van in regard to solving of the problems presented by this variety. At present Ceylon is a novice in regard to tapping Ceara, but in two or three years when our plantations are coming into bearing here, they will have had more experience with that variety there and will probably be of service to us. However, we should solve many of these problems ourselves and have a chance to be "leaders" in regard to this variety.

This variety certainly has its own distinctive problems. Such as handling of the outer bark, after the first tapping, the rapid coagulation of the latex on exposure to air, etc., etc. First tapings are so far as they have advanced in regard to *Castilloa* on a large scale. So that, take it all in all, the rubber growing industry is still in its infancy.

Briefly, we will take up some of the questions to be answered in any variety with the experience elsewhere:

METHODS OF PLANTING.

1. *In Nurseries*.—This is the most successful way in regard to the Hevea. Subsequently the nursery plants are planted out as seedlings or stumps. Some have used baskets for seedlings, but this has been given up. Planting stumps, however, has proved the best method. There has been some talk, I believe, of

planting this year's Hevea seeds in Nahiku in baskets, but I think planting in a clean weeded nursery in a warm locality and then stumping those that have grown very well, would be best. They can remain even one or two years in the nursery, if necessary, in this way, though probably the next spring would be a good time.

2. *At Stake*.—Insects, rats, etc., are very troublesome when this is done. This method is very successful in Castilloa, however, when seeds are cheap and a number can be planted together and one plant used.

DISTANCES IN PLANTING.

This is a most important subject and one on which there is a very great variety of opinions.

There are great variations. Trees are planted all the way from 10x10 or 400 to the acre, to 20x20 or even 30x30, 15x15 or 200 to the acre is considered medium planting. Many plant closer along the rows and with wider distances between the rows, as 10x10 and 20 feet between the rows, or 15x15 and 20 feet between the rows.

However, it may be said that the general trend of opinion in the Malay peninsula and Ceylon is towards wider planting and more room for the trees.

CLOSE VERSUS WIDE PLANTING.

In general, it may be said that close planting is more suited to poorer land and wide planting to more fertile land. The plan of planting closely with the idea of, in the early years, cutting out alternate trees, has not been found to be very successful, as they have to be cut out before they are old enough to pay for themselves or much more than do so, and in cutting them out branches of the other trees are damaged and theoretically there is more danger of disease from the stumps, etc. One argument for wide planting is shown in the results on the highlands and lowlands estate in the F. M. S. as cited by Ivos Etherington. A block of Para rubber trees 16 acres in extent contains 807 trees planted 30x25 feet. These are nine years old and completely cover the ground. Over the whole estate the year's crop amounted to 95,333 pounds from 33,967 trees tapped all through the year, and 4,672 lightly tapped. The average yield is 2.46 pounds

per tree per year; but from 807 widely planted trees the yield during the year was 5,742 pounds of rubber, giving an average of 7.05 pounds per tree. Of course, this is not conclusive as the bulk of the trees were of all ages, though many of them were nine-year-old trees.

CEARA TREES.

That our Ceara trees planted 400 to the acre will have to be thinned out eventually there is no doubt. However, by having the first tappings made on alternate trees, skill in tapping and experience can be acquired by tapping the trees which will eventually be cut out before the alternate trees are touched, which can be allowed to grow considerably larger before being tapped.

However, in these plantations at Nahiku, which have a considerable number of their trees planted 400 to the acre, it would seem advisable to plant, if not the rest of their acreage with 200 trees to the acre say, at least enough to be able to judge later which proved to be the best method. One distance in planting should not be adhered to exclusively when in the development stage.

When countries where it costs almost nothing more to have 400 to the acre because the place is clean-weeded anyway, consider 200 to the acre moderate distance, it seems as though where it is considerably more expensive to plant so many trees as it means so many more trees to clean a circle around, that in this case, I say, it might be wise to have part of the planting at least with greater distances and more room.

From the shape of the trees, one would imagine that a Ceara tree having, when well shaped, such a dome-like expanse of leaves, would need even more room than the Hevea. The thickness of the trunk is dependent on the number of leaves and the sunlight that gets to them. With this object in view, some planters thumb prune their young trees, removing the terminal bud when the sapling gets to be 10 feet high or over. This gives rise to two branches, which, after being allowed to grow a short distance, are again thumb pruned, etc. This greatly increases the leaf area and a consequent increase in girth of the trunk results

CASTILLOA.

With the *Castilloa* they do differently, planting a number of seeds on hillocks close to each other and gradually thinning out by experimental tappings until they obtain the desired number per acre. However, this is necessary in *Castilloa*, as many of the *Castilloa* do not give latex, whereas in *Heveas* and *Cearas* in the right localities and particularly with *Heveas*, there is a marked uniformity. Often with *Castilloas*, even with this careful selection, barren trees or those which soon become so, are left occasionally.

WEEDING.

There is no doubt that clean weeding is best, though expense may prevent it being carried out.

TAPPING.

This is of course most important, and here the greatest advances will come, next to the preparation of the rubber after collection of the latex.

For *Hevea*, various tapping tools have been devised, with the main object of not cutting into the cambium or growing part of the bark. It matters not whether the single V, the herring bone, modified herring bone, spiral or what the incision made, the sum-mum bonum is to get the greatest amount of latex with the least loss of bark and the least injury to the cambium.

If the cambium is uninjured or left in strips on the bark new bark will grow up. It has been found best not to tap this new bark the next year, but in two years it can be tapped again though normally it may not be necessary for a longer period than that.

There is another factor bearing on the subsequent yield of the tree and that is that the tree suffers from shock when the latex is removed in a large amount which is minimized by the system of multiple tapping to which the *Hevea* variety lends itself so admirably, and in fact this is one of the things which have contributed in giving it the power of yielding in larger and larger amounts when tapped year after year.

The *Ceara* promises to do likewise and it is up to us to demonstrate it. The *Castilloa* yields all at one time and in large quan-

tities there being much less rubber in the latex according to the coagulation and preparation. The Hevea latex is coagulated in various ways, but most often by acetic acid. The rubber is shipped in pancakes or run through a machine giving crepe rubber or as worm rubber, or best of all, crepe rubber is blocked under pressure so that little of the surface is exposed. In Castilloa the rubber is creamed off after mixing with water.

SPECIES FOR HAWAII.

As to the variety growing here Ceara grows most luxuriantly and in proper localities seems to yield extremely well. Hevea grows very slowly and may not yield at all. If we can raise enough Hevea to have our own seed supply, then, if it is going to pay we can plant up Hevea in place of the Ceara, though we may find it to our advantage not to do so.

As to quality Hevea and Ceara are about on a par.

ACREAGE IN RUBBER.

There is no question of the tremendous amount of planting going on—250,000 acres in Ceylon and the Malay States, 90,000 acres planted in Mexico. Plantings in Borneo, Java, Samoa and many South Sea Islands. Planting in Central America and Africa, and in fact all over the tropical world. But on the other hand we planters see that side of the question as the largest. Some cry over-production; on the other side are the manufacturers saying we never can have too much rubber. The consumption is doubling every ten years and there are new uses every day.

PRICE OF RUBBER.

Think of the increase of the automobile trade. Probably, however, the result will be that there will eventually be a considerable reduction in price after a few years which will multiply the uses of rubber and keep up the price. If we can produce it for 30 or 40 cents a pound, it will be profitable for many years to come.

RUBBER PESTS.

Mr. L. A. Thurston now read a paper by Mr. Kotinsky on rubber pests. This paper is included in this issue and forms a separate article.

Mr. C. J. Austin, who was now called upon to address the meeting, spoke in part as follows:

NO DANGEROUS PEST IN HAWAII.

"In the Territory of Hawaii the rubber planters are unusually fortunate. There are a few insects which will need some care, but I believe that I can say that in every case we have at hand the parasite which will destroy the pest. There may be some which we do not know of as yet, but I doubt if there are any of sufficient importance to cause trouble if the trees are carefully watched.

"There is some slight indication of a fungus disease, but this troubles only the leaves and has not gone into the wood, where it would create damage to any extent. On this account, with prompt action and care I believe we are safe from trouble of this kind. There are fungus diseases extant in this Territory which attack the roots, but so far they have never attacked rubber. On the whole I believe that I am safe in saying that we are very fortunate and have no insect or disease which can be considered a dangerous enemy to our new and coming industry of rubber production."

Mr. D. C. Lindsay, President of the newly formed Hawaiian Rubber Growers' Association, at the request of Governor Frear, spoke as follows:

THE FUTURE OF RUBBER.

"The large number of vigorous and healthy rubber trees which I have seen here today have impressed me most favorably. The new industry appears to me to be most promising and I expect that it will go ahead. We are always in a matter of this kind apt to err on the side of conservatism. It is hard indeed to have faith in something that one cannot see before him, but I believe that there is a great future ahead in store for rubber growing in the Territory. Fifteen years ago there was no one in the islands who could foretell the tremendous amount of sugar which is now being raised here. If it had been predicted it would have raised a laugh. It is a common saying that a man from the country must go to the city to see wonders and learn, but from what I have seen today the reverse is true and the men from the city should come to the country.

"The same thing in the line of conservatism is true of the pineapple growers, but the exportation of the past year has opened the eyes of the people to what may be done. The best feature in both of these industries, pineapple and rubber growing is, to my mind, the fact that it is not only a business in which the capitalist may embark, but is also eminently fitted for the small farmer.

"It hardly needs imagination to see what rubber may become in this Territory. From what I can find in the figures which have been brought to my attention, it appears that if only a part of what those who should know believe to be true, comes to pass, rubber will be a far more profitable crop than sugar, and if planted in this Territory acre for acre with that product, will bring in far more wealth to our people. There are, indeed, strong grounds to believe that the rubber industry will stretch to the same extent that rubber itself will."

Mr. B. F. Dillingham, who was called on to say a few words, responded in the following manner:

A GREAT FUTURE.

"I must say that I have been surprised, to use a familiar expression, over what I have seen today. I have never known much about rubber, and to see the extent to which the growing of this product has reached has astonished me. I am optimistic by nature, unless it happens that I feel ill, and from what I have seen today I must say that I feel first-class. I believe in new industries, and my record will show that I have always done everything that I could to further them, to the extent of investing my own money and getting my friends to invest theirs. Rubber appears to me to have a great prospect ahead, and I certainly hope that everything will keep on as it has so far, and if that occurs there will be no complaint from anyone."

The last speaker called upon was Ralph S. Hosmer, of the Bureau of Agriculture and Forestry, who said:

"I am very glad to be here once more and to have an opportunity to see more of the rubber plantations, which are now nearly, if not quite, a success. The organization of the Rubber Growers' Association can not but be a step productive of good. The bringing together of the various interests in this line that they may consult, and that the one may through this benefit by

the experience of the other, is sure to help each and every one who is interested in rubber growing.

A GOOD START.

"I believe that the main hope of this Territory is in the establishment of other industries than that of sugar. The rubber growing work has received a good start, and it should go ahead, and will before we know it reach proportions which will make it not only of great importance to the Territory, but also to the entire United States."

The meeting was closed with a standing vote of thanks to the members of the association who had spoken during the day, and in particular to the ladies who had entertained the excursionists so generously and had been so careful in looking after their comfort.

LOCAL NOTES.

The report is once again brought of a large find of ambergris occurring in Hawaiian waters. The value of this marine product is very great and a block of several pounds would be a most fortunate discovery. Unfortunately, however, all of the "ambergris" which we have seen in the last few years, and which has been displayed with great ceremony by its owners, has turned out upon inspection to be some worthless composition which was not worth the pains of salvage.

A contract has recently been signed by the Hawaiian Mahogany Lumber Co. and the Atchison, Topeka and Santa Fe railroad, by which the former engage to export 90,000,000 board feet of ohia lumber to the mainland in the next five years. The transaction involves a sum of over two and a half million dollars. The lumber will be used for railroad ties, for which purpose it has been shown to be thirty per cent. better than the white oak, which hitherto has been the standard of excellency.

The shipment of the lumber will be made from Hilo and some 50,000 tons will be forwarded each year. The contract size of the ties is six by eight inches, and eight feet in length.

FRUIT MARKETING EXPERIMENTS.

BY J. E. HIGGINS.

Fruit growing is destined to become one of Hawaii's most important industries. Already pineapple growing has assumed large proportions, and other fruits are certain to follow. To ascertain the best methods of marketing, including every step in the process from the gathering of the fruit in the field to its sale, is quite as important a factor in any fruit industry as that of production. To determine some of the important elements in marketing, the Hawaii Experiment Station has undertaken a series of experiments which has now covered some four years. During the present season two experimental shipments have been made with very satisfactory results.

The first shipment, in 1907, which I accompanied personally, left Honolulu, July 24th. It arrived in San Francisco on the 30th, and a part of it was trans-shipped to Los Angeles. Careful notes were made of the conditions of different lots of fruit, illustrating different methods of packing and handling. Cable advices were sent to Honolulu embodying some of the more important results, in order that advantage might be taken of the experiments of the first shipment in preparing and forwarding the second. The second shipment arrived in San Francisco, August 21st.

Owing to very unfavorable conditions of weather at the time of gathering the fruit and packing at the plantations at Wahiawa, a considerable portion of the fruit did not arrive in condition to warrant trans-shipment. The pineapples were opened, sorted, and repacked, the riper specimens being left in San Francisco for sale. The fruit which had been picked and dried before packing arrived in San Francisco in most excellent condition, so that nearly all of it could be shipped East. The portion that was suitable for shipment, together with the avocados was placed in a refrigerated car on the 22nd and started on their journey to Sacramento, where the car joined a fruit express and proceeded to Chicago, arriving late in the afternoon of August 31st. September 1st being Sunday, and the 2nd Labor Day, it was not possible to handle the fruit of the car until Tuesday, the 3rd.

On September 3rd a large committee appointed by the Chicago Association of Commerce, visited the car and manifested much

interest in the condition of the fruit, and in its size and quality. The avocados attracted much attention as a curiosity, many of those visiting the car being unfamiliar with them. The avocados arrived in first-class condition for immediate consumption, while the pineapples were in so excellent a state of preservation that experienced fruit men in Chicago declared that they could be trans-shipped to Liverpool or to any of the great markets.

Though not the primary object of the Experiment Station, the wide advertising which was given Hawaii in general, and Hawaiian fruits in particular, incidental to these shipping experiments, means much to Hawaiian fruit industries. In this phase of the experiments, as well as in the examining of the fruit in Chicago, very great assistance was rendered by the Chicago Association of Commerce. On Wednesday, September the 4th, the Executive Committee of the Association held a luncheon at the Great Northern Hotel, which was known as the Hawaiian luncheon. On this occasion our pineapples and avocados were served and received high praise. I cannot say too much of the enthusiastic interest manifested by every member of the Association whom I met. A more broad-minded and genuine lot of business men I have not met anywhere. In the development of a market for our fruits in Chicago, I can assure the growers and shippers that the business community of Chicago will render every assistance possible.

The extent of the market for pineapples in the future will depend wholly upon the development which is made by the shippers and upon the condition and quality of the fruit on arrival. The experiments lead me to believe that with proper shipping facilities to place the fruit in San Francisco, and with proper agencies there to handle and trans-ship, our pineapples and avocados can be placed in every large market in America. Between San Francisco and points west of Ogden it will probably be necessary at first to ship mixed cars in conjunction with other shippers from San Francisco or Sacramento. At Ogden at least one firm was willing to buy pineapples by the carload. Salt Lake City, which is a larger market, could unquestionably take carload lots. In Denver many wholesale fruit houses were anxious to buy fruit by the carload. Though I was not able to visit Kansas City, Omaha, or any of the other large cities of the western country not mentioned, I have no doubt that the same condition of markets exists there as in Ogden, Salt Lake City and Denver. As an

illustration of the amount of fruit which is consumed in the city of Chicago and shipped from that center to outlying points, I may say that on one day during my short stay in Chicago 23 carloads of California grapes were sold at public auction. The people must be taught to eat any fruit before there will be unlimited markets for it. This has been demonstrated over and over again in the case of bananas, pomelos, and many other fruits.

One of the first difficulties which I found confronting the Hawaiian fruit shippers was the high freight rate. This matter was taken up with the freight department of the Southern Pacific railroad and a rate was secured on tropical fruits the same as prevails in the case of deciduous fruits. The Southern Pacific Company took up the problem with the Inter-State Commerce Commission, asking for the privilege of advertising a rate on tropical fruits. The rate sheet now reads, "Deciduous and Tropical Fruits." The freight rate to Chicago is \$1.15 per hundred weight. To this must be added \$85 for icing charges from San Francisco to Chicago. This opens the way for commercial shipments to all points East.

The Bureau of Agriculture of the Philippines is importing sisal plants from Hawaii with a view to establishing the industry there. This is remarkable in view of the fact that the Philippines are already the center of the production of Manila hemp.

H. Rosenberg, N. Yamakami, H. T. Moore, C. J. McCarthy and C. G. Bartlett have organized a corporation to engage in the manufacture of soy sauce and vinegar.

The Waialua Agricultural Co. has applied for the purchase of about 400 acres of remnants of land in the Kaukonahua gulch.

In the Chicago Post of September 3, Secretary Straus in giving his impressions of Hawaii says: "Well-to-do American laborers, I think, would find it to their advantage to go there, as the Territorial government is desirous of giving them every facility to establish themselves, especially those who follow agricultural pursuits."

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY.

INSECTS AFFECTING RUBBER PLANTS.*

BY JACOB KOTINSKY.

Our knowledge of the subject is far from complete and, aside of the few insects known to attack rubber trees on these islands, must depend upon notes compiled from other sources. The Government Entomologist of Ceylon, Mr. E. E. Green, has published in the *Tropical Agriculturist*, among others, a large number of notes on the insects affecting these plants in Ceylon and to these notes we are largely indebted for what we were able to gather. As we are still obliged to import numerous seeds and stumps from other countries it was deemed advisable to group the insects according to the country from which they were reported. It is gratifying indeed to know that so far we have managed to steer clear of the specific rubber tree insect pests reported from other countries. Those we have here are common thruout the Territory, affecting a large variety of plants and seldom injurious, because of the parasites and predators introduced by Mr. Koebele to keep them in check.

HAWAII.

The insects affecting rubber trees on these islands thus far brought to our attention are the following:

1. The Black Lecanium (*Saissetia nigra*) was collected on Ceara (*Manihot glaziovii*) in Honolulu (Webster); also in Nahiku (Anderson).

This scale is very common on a large number of plants in the Territory. It has been observed occasionally in rather large numbers on Hibiscus, but invariably accompanied by its enemies, which are at least three species in number, viz: *Tomocera californica*, an egg parasite; a minute internal parasite, name unknown; the larvae and adult of the Australian black ladybird (*Rhizobius ventralis*).

*Read before Rubber Growers' Convention at Nahiku, Maui, Oct. 12, 1907.

2. The "Spotted mealy bug" (*Pseudococcus virgatus*) on leaves of Ceara, was twice received from the windward side of Oahu thickly infested with this mealy bug. In both instances the bugs were accompanied by their natural enemies, which are well known to keep them in check. These comprised the black ladybird above referred to, the "Brownie" ladybird (*Cryptolaemus montrouzieri*) and at least one internal parasite. This latter is a comparatively large, black, four-winged fly usually abundant in the presence of the scale and a powerful aid in keeping it in check.

3. Red spider or mite. The identity of this animal (being a mite it is more closely related to spiders which are not insects in the true sense of the word) has not been ascertained, but it belongs to a species very widely distributed both as to territory and plant host on these islands. It has been observed on leaves of Ceara in Honolulu. I imagine it might prove serious on young plants in which case a sulphur wash applied to the under sides of the leaves will keep it in check.

4. An undetermined species of aphid or plant lice has been observed by Mr. Austin and others on the Maui rubber plantations. These plant lice seem to gather about the mid rib and leading veins on the under side of the leaf. Their punctures cause an exudation of the latex which, after drying, assumes a marked resemblance to scale bugs. There are a number of useful insects that keep all sorts of aphid on these islands in subjection, but if immediate relief becomes necessary it will be found in an application of a soap solution of one pound of soap to four gallons of water. Any soap will answer the purpose and, if the leaves are delicate, ivory or castile soap, because of their neutrality, will be found best.

5. No specimens were sent, but reports were current that "worms" are wont to attack seeds in the bed. So far as investigated those seeds suffered for having been filed too deeply.

6. What seemed to be related to a group of destructive mites (*Rhizoglyphidae*) was found in numbers upon seeds imported from Mexico in course of inspection. The seeds were promptly fumigated and planted in beds at the Government Nursery where they remained under observation until it was certain the plants were free of them.

NOTE.—This completes the insects of rubber so far observed on these islands.

MEXICO AND CENTRAL AMERICA.

1. Mr. Robert Newstead, of the Liverpool University, reports the following: A scale bug (*Aspidiotus cydoniae*, Comst.) on *Castilloa* from Nicaragua.

This scale bug is quite common in this Territory on guava and other plants, but thus far not reported on rubber. It is also well kept in check by parasites.

2. A long-horned beetle (*Taeniotes scalaris*, Fab., var. *suturalis*, Thoms.), a borer on *Castilloa* from Nicaragua was reported by the same author.

3. A scale bug closely allied to our black scale above (*Platysaissetia castilloas*) was collected on *Castilloa* in Mexico by Prof. C. H. T. Townsend.

4. The Manihot scale (*Lecaniodiaspis manihotis*) was collected by the same person on "Nettle tree" (presumed to be a species of Manihot) in Mexico.

SINGAPORE AND INDIA.

Upon material recently examined, which was kindly submitted to me for study by the Sugar Planters' Station, and collected by Mr. Muir in Singapore, and labeled "rubber," two species of armored scale bugs were identified.

1. *Aspidiotus palmae*, Morg. & Ckll.

The species has not hitherto been reported from rubber, but it seems to be very common in the vicinity of Singapore as it was collected there by Mr. Muir on a variety of plants.

2. *Chionaspis dilatata*, Green.

This is one of the Snow scales and only a few specimens were found on the material studied.

3. A termite or white ant to be referred to under Ceylon is reported very destructive to rubber trees in India.

CEYLON.

The largest number of insects known to attack rubber is to be found in Ceylon. This fact does not necessarily indicate that Singalese rubber trees are most affected. Our knowledge of Singalese rubber insects may be more extensive merely because they were studied by a competent entomologist.

Scale Bugs. (1). The Greedy scale (*Aspidiotus camelliae*) was collected in numbers on a *Castilloa* plant suffering from root fungus. This scale bug is quite common in this Territory and occasionally very numerous in the mountains on Ohia and Koa, but not reported on rubber thus far. But in view of the presence of what are quite effective enemies it need not be feared.

2. A species of *Lepidosaphes* (a scale allied to our purple scale so common on citrus plants) was collected on Para (*Hevea brasiliensis*).

3. Grasshoppers were observed nibbling off young plants in the nursery. The occasional abundance of grasshoppers in this Territory might result in damage to young plants in our nurseries also if they are not protected. We have, however, a number of parasites that keep these animals subdued and, if necessary, we can readily check their work by means of a poison.

4. A species of long-horned beetles (*Mocchotypa verrucicollis*, Gahan) was bred from stumps of Para rubber. This group of insects is usually found to attack plants after their vitality has been previously weakened in some way. In this instance Mr. Green, who records the fact, has found that the plants were suffering from a root and collar fungus (*Botryodiplodia elasticae*, Petch.).

5. Another beetle of this group (*Pterolophia annulata*, Chev.) was bred from young Ceara trees. It was also reported from India where it actually ringbarks the trees. Mr. Green thinks that it may prove serious, but from the habits of this group as indicated above it would be well to look into the health of the tree previous to its being ringbarked.

6. A number of bees and wasps were found to build their nests in cavities of living rubber stumps or the pith of dead twigs. It is quite possible that one of these bees or wasps finding a cavity not wholly to its satisfaction will gouge out some of the substance to increase it. This, of course, means a wound, the escape of latex, an opening for the entrance of disease. It is well, therefore, to plug with earth all cavities and to trim away dead twigs. In trimming it is wisest to cut at the node else the cut surface will die down to the node next below, with all attendant ills.

7. The grubs of a cockchafer, (a beetle) were found to feed on the roots of *Hevea* and particularly troublesome to young

rubber trees and to remedy the evil Mr. Green recommends an application of Kainit or Saltpeter, either of which is death to the insect and vigor to the tree. It is unlikely that our Japanese beetle, the grubs of which live in the ground, will attack young rubber trees for the reason that the ground is usually wet in rubber forests, a condition favorable for the fungus that kills this beetle.

8. Termites or white ants were found to invade rubber trees and found to do considerable damage. They usually make their entrance into hollows which it is advised to plug up. A somewhat alarming report was circulated about the habits of a species of white ant (*Termes gestori*, Wasm.) in India to feed on the latex of Para. It is found at the roots of trees where its nests are located. Mr. Green believes that there must be an error about this rubber-eating habit. There is no doubt, however, that some species of white ant will attack rubber trees as well as others and it is well to be on guard.

9. The fungus disease referred to above seems to be the most serious enemy of rubber plantations in Ceylon. I believe Dr. Cobb has reported to some of the rubber plantation managers on Maui upon diseases found on their plants and recommended remedies.

I am certain that we are still free from serious insect pests on rubber plants and doubt whether the fungus diseases referred to are of any material consequence. The above list of insects affecting rubber in countries upon which we draw for our seeds and plants should bring us to a full realization of the importance of careful and conscientious inspection of rubber seeds and plants imported from outside the Territory. You can depend upon the thoroughness of inspection of plants, etc., that come by way of Honolulu. But I presume there is always a chance for the ambitious (?) manager to import surreptitiously seeds and plants and evade our inspection laws. If these notes succeed in impressing you sufficiently with the importance of, so far as possible, keeping out possible insect pest invasion to the extent that consignees will refuse to accept or introduce foreign rubber seeds or plants unless they are accompanied by a stamp or certificate from the Territorial Inspector indicating that they have received his attention, they will not have been presented in vain.

REPORT OF HORTICULTURAL QUARANTINE INSPECTION WORK.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my last report to your honorable Board I have to record the arrival of seventy-eight steam and sailing vessels from outside the Territory, bringing eighteen thousand two hundred and fifty-three packages of fruits and vegetables and only five cases of plants, as this is not the season for importation of plants. By postal receipt we inspected fifty-five packages of seeds and plants, some of which we had to fumigate or disinfect for insects or fungi. Two hundred and seventy sacks of potatoes badly infested with potato scab (*fungi*) we returned to California.

All importations of rice have been carefully examined and found clean from rice pests until the arrival of a small package by mail that we found slightly infested with "rice weevil" (*Calandra oryza*) and the larvae of *Tenebroides mauritanicus*. The first large importation of rice arrived on the S. S. "Mongolia" on July 23rd, consisting of six thousand seven hundred and forty sacks. As the insects found in this were alive, showing that the rice had not been fumigated in Japan as required by our laws and your regulations we had the importation removed by the steam barge "Pioneer" to the fumigating chambers on the Channel wharf where we treated it with bi-sulphide of carbon. We notified Collector Stackable of its condition and he refused the delivering thereof until we notified him that the insects were all destroyed. A delegation of the rice importers called upon us and stated that they were out of bi-sulphide of carbon in Japan and it would be impossible to again fumigate the rice in Japan during this season and that they were willing to have it fumigated here and pay all expenses. I informed them that I would bring the matter before you.

During my two weeks' vacation on Hawaii my assistants, Messrs. Kotinsky and Jordan, attended carefully to the inspection work and during that time destroyed several lots of in-

fested fruits, a lot of sugar cane cuttings from Australia infested with leaf hoppers and fungus, also some pumpkins from Japan infested with dipterous maggots.

Respectfully submitted,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

APPOINTMENT OF DEAN.

Mr. J. E. Roadhouse, B. Sc., has been appointed Dean of the Faculty of the Hawaiian College of Agriculture and Mechanic Arts. The appointment of Mr. Roadhouse was made through the recommendation of Professor Hilgard of the University of California.

The new Dean is a Bachelor of Science of the University of California and a Post-graduate of Cornell University. For two years he has been Dean of the Technological Institute at San Luis Obispo, California, and afterwards held an appointment in the State Irrigation office at Berkeley, which office he is now relinquishing to take up his new work in Hawaii.

FRUIT EXPORT FROM HAWAII.

In the July number of the Journal of the Society of Art, London, is a contribution by Mr. F. J. Testa, on the transportation of fresh fruit from Hawaii to the United States. The article deals with the development of diversified industries in Hawaii and with the legislative enactments relating thereto, and is a useful and thoughtful statement of the subject.

AGRICULTURAL NOTES.

RHIODES GRASS.

A correspondent to the *Agricultural Gazette* of New South Wales writes of the above grass that in sixteen to twenty days after sowing young plants appeared. Although not germinating as quickly as it was reported to do, it made good headway from the first, and surpassed in this respect even *Paspalum dilatatum*.

EGG-LAYING COMPETITION.

Considerable attention is devoted to egg-laying competitions in the Australian colonies. At a recent one promoted by the *Sydney Morning Herald* and the *Sydney Mail* a 200-egg average for every hen in the competition was almost attained. Hawkesbury College has for several years taken an active part in these competitions and from a first average of 130 eggs per fowl, the number has steadily risen until in 1906 a record of 195 eggs for every one of the 300 hens entered was attained. In the latest competition the winning pen of White Leghorns totalled 1473 eggs for the twelve months, averaging 28 ounces to the dozen. The actual eggs laid monthly, commencing with May, was as follows: 105, 129, 148, 142, 152, 142, 122, 122, 122, 111, 108, 70. A pen of White Wyandottes produced 1444, and another of White Leghorns 1412 eggs respectively, during the period of observation.

LEMON CURING.

The *Agricultural Gazette* of New South Wales for June, contains a valuable paper on Curing the Lemon, by W. J. Allen. It is fully descriptive of the process and is well illustrated.

RULES FOR EGG COMPETITION.

The following list of rules governing the egg-laying competition at Hawkesbury Agricultural College is of interest:

1. The competition to commence April 1 and end Sept. 30.
2. The competitors to pen their birds in March. Each pen to consist of six pullets or hens of any age, no male bird to be included.

3. All birds to be bred by competitors.
4. All birds to be examined on arrival at the college and any suffering from disease to be rejected; in the event of a bird dying, the competitor to be allowed to replace it.
5. All eggs to become the property of the Department of Agriculture.
6. The competition to be decided by the greatest total number of eggs laid by each pen. Eggs under $1\frac{1}{2}$ ounces not to count.
7. The market value of the eggs laid to be recorded and the weight of the eggs from each pen. Prizes to be given for the greatest aggregate weight.
8. Records to be kept of the total quantities of the various foods consumed and the average cost per head.

THE HOUSE SPARROW.

This bird is rapidly spreading in New South Wales. While the bird is inflicting much harm it is recognized that it also does a certain amount of good. It is believed that the bird cannot be exterminated, but eventually when all the opposing hostile factors to its increase are in operation it will find its definite place in what is known as the "balance of nature." Among its enemies are included the mosquito, which causes mortality among the young birds.

THE CROSS-BREEDING OF SHEEP.

Under the above title, R. H. Gennings contributes a well illustrated article to the *Agricultural Gazette* of N. S. W. for May.

GUERNSEY COW RECORD.

A Guernsey cow, bred in England, and now in America, possesses the following remarkable record: At two years old she produced 9,958 pounds of milk and 533 pounds of fat for the year. At four and a half years old, she yielded 13,636 pounds of milk and 714 pounds of fat, the average being 5.24 pounds. She was lately sold for £800.

RAMIE FIBER.

The fiber of the Ramie plant is about the best, the longest and strongest known. The difficulty of extracting it from the stem

is, however, very great and consequently nearly all growers of Ramie have so far lost money on it. The opposition to be overcome by those endeavoring to introduce a new fiber renders its success almost impossible, as no manufacturer will buy unless it is better and cheaper than standard libers and can be guaranteed regularly in large quantities. The price offered by the Ramie mills it at present much below the cost of production.

CHILI SAUCE.

The following recipe is from the Journal of the Jamaica Agricultural Society for May: Thirty ripe tomatoes, ten onions, six green peppers, two cups sugar, five tablespoonfuls salt, one pint vinegar. Peel the tomatoes and cut, chop the onions, boil for two hours.

PINEAPPLES IN JAMAICA.

Pineapple growing as an industry has not been profitable in Jamaica, although ideal conditions exist and shipping facilities are good. The cause of this failure is said to be attributable solely to the choice of a wrong variety of fruit. The Smooth Cayenne and the Rippley pines are reported as the rocks upon which the industry has been wrecked. It is now proposed to give more attention to the Red Spanish pineapple of which much is hoped.

MEAD OR HONEY BEER.

The following recipe is taken from the Queensland Agricultural Journal. Its simplicity of manufacture should commend this excellent beverage:

Take five gallons of rain water and add one quart of honey. Boil gently for one and a half hours, skimming often. Empty into an earthen vessel, and when blood warm pour into a clean cask. The bung should be fitted loosely. If kept in a warm room, fermentation will begin in from five to fifteen days. After fourteen days fermentation, draw off into another cask, leaving the dregs. In the second cask fermentation should be allowed to proceed from 10 to 14 days. When the mead is calm, so that nothing more is heard in the cask, close the bung. After thirty days draw off into bottles, cork well and pack in sand.

The ancient Germans attributed health and longevity to the use

of mead. In cases of fever it is found very beneficial, as it is delightfully cooling and refreshing and has not the injurious effect of wine or beer.

HEIGHT OF A LIGHT.

Question. I want to put up a light to show 10 miles. Can you tell me how high above sea level I should place it?

Answer. Multiply the miles by itself and also by four, and divide the product by 7.

Thus: $10 \times 10 \times 4 = 400$

$400 \div 7 = 57 \frac{1}{7}$

The light should be $57 \frac{1}{7}$ feet above sea level or above level plain country.—*Queensland Agricultural Journal*.

CONCRETE FOR SILOS.

The use of concrete for the construction of silos is advocated by the Journal of the Department of Agriculture of Victoria. It is said to be both cooler and warmer than brick or lumber, and to be little more costly than lumber.

EGG-LAYING RECORD.

The world's egg-laying record for twelve months is held by Mr. W. Williams of Clarendon, Australia, whose six birds have laid 1494 eggs for that period. The net profit per bird represented by the above production is about \$2.25. The value of good laying hens needs no further comment.

REFORESTATION IN FRANCE.

The denudation of the French watersheds had become so serious that in 1860 the government appropriated \$15,000,000 to purchase 400,000 acres of the deforested area. For the last forty years an annual expenditure of \$600,000 has been made for reforestation, and the acquisition of an addition tract at a cost of \$20,000,000 is now projected.

VALUE OF PEANUT CROP.

The value of the peanut crop of the United States exceeds \$15,000,000 annually. It reaches about 400,000,000 pounds and nearly half a million people are engaged in its cultivation. As an improver of the soil, the peanut is said to equal any leguminous crop.

BANANAS IN FRANCE.

It is astonishing, says Mr. Consul-General Hearn (3283-152), in reporting on the trade of Havre, how popular bananas have become in France. Not so long ago the banana was a rarity; now it is to be found hanging up in every fruiterer's window. The bulk of the bananas consumed in Europe are imported from the Canary Islands by British firms. The West Indian banana does not appear to have reached the Continent in any great quantity as yet. In 1877 only 5,000 bunches of bananas were imported into France! this rose in 1901 to 50,000 bunches, and in 1904 to 250,000 bunches. Paris takes about half the quantity, and then the two chief consumers are Marseilles and Bordeaux. The wholesale price of a bunch is, on the average, 12s. 6d. The bananas are sold retail at three sous a piece, and as there are from 150 to 200 bananas on each bunch, that price brings the retail price of the bunch to from 16s. to 20s., which gives a profit of from 4s. to 8s. per bunch. The bananas sold in the South of France and Algeria, although sold under the name of Dahomey bananas, as a rule all come from the Canaries. The highest prices are obtained in the spring and autumn. Before France, encouraged by the high prices she has to pay for her bananas, takes to growing them herself in the many colonies suitable to their cultivation, it would be well, Mr. Hearn thinks, for British firms to stimulate the importation and taste for Jamaican and other West Indian bananas, which, in his opinion, are finer than the Canary fruit.—*Journal of the Society of Arts*, London, Sept. 20, 1907.

COLOMBIAN BANANAS.

Reporting upon the trade and commerce of Barranquilla and Catagena (Cd. 3283, 145), Mr. Consul Gillies says that, owing to an increased demand, there has been an enormous development during the last few years in banana cultivation. The banana enjoys great advantages over the other products of the country in that it is more easily cultivated, and is not burdened with the large freight expenses which makes the export of coffee and other articles grown in the interior so expensive. A good deal of land has recently been bought in the neighborhood of Santa Marta for the cultivation of the banana, and both native and foreign capital is being largely invested in the business. The United States is still the largest consumer, but there is now a

good market in Europe, and it is increasing year by year. The bananas produced in the district are contracted for by the United Fruit Company of New York, and are shipped to that port weekly by vessels of the Hamburg-American line, which are specially chartered for the purpose. From all accounts the cultivation of the banana is a most lucrative investment, and the prospects for the future, in view of an ever increasing demand, are bright.—Journal of the Society of Arts, London, August 23, 1907.

RECENT PUBLICATIONS.

FARMERS' BULLETINS.

Farmers' Bulletin 302.

Sea Island Cotton; Its Culture, Improvement, and Diseases. By W. A. Orton, Pathologist, Bureau of Plant Industry. Pp. 48, figs. 13.

Economic importance of the Sea Island cotton industry, geographical distribution and ideal requirements of the crop, possible extension, markets, factors governing prices, etc., with directions for the cultivation and handling of the crop and methods for treatment and prevention of diseases.

Farmers' Bulletin 303.

Corn-Harvesting Machinery. By C. J. Zintheo, Expert in Farm Mechanics, Office of Experiment Stations. Pp. 32, figs. 20.

This bulletin is a condensed summary of the report on corn-harvesting machinery published as Bulletin 173 of the Office of Experiment Stations, and contains illustrations of corn harvesters, binders, shockers, loaders, pickers, huskers, and shredders, with directions for their use.

Farmers' Bulletin 305.

Experiment Station Work, XLII, Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32.

CONTENTS: Extension of rice culture—growing seed potatoes under mulch—Manure as a summer mulch in forcing houses—Renewal of old orchards—Injury by Bordeaux mixture—Gluten flours and similar foods—Laxative properties of wheat bran—Emmer as a feeding stuff—Roots for farm animals—Cabbage as stock feed—Pasturing hogs—Cull beans as a feed for hogs—Healthy poultry.

The above bulletins may be obtained free from the Secretary of Agriculture, Washington, D. C.

EFFECT OF MOISTURE ON WOOD.

The effect of water in softening organic tissue, as in wetting a piece of paper or a sponge, is well known, and so is the stiffening effect of drying. The same law applies to wood. By different methods of seasoning two pieces of the same stick may be given very different degrees of strength.

Wood in its green state contains moisture in the pores of the cells, like honey in a comb, and also in the substance of the cell walls. As seasoning begins, the moisture in the pores is first evaporated. This lessens the weight of the wood, but does not affect its strength. It is not until the moisture in the substance of the cell walls is drawn upon that the strength of the wood begins to increase. Scientifically, this point is known as the "fiber-saturation point." From this condition to that of absolute dryness the gain in the strength of wood is somewhat remarkable. In the case of spruce the strength is multiplied four times; indeed, spruce, in small sizes, thoroughly dried in an oven, is as strong, weight for weight, as steel. Even after the reabsorption of moisture, when the wood is again exposed to the air the strength of the sticks is still from 50 to 150 per cent. greater than when it was green. When, in drying, the fiber-saturation point is passed, the strength of wood increases as drying progresses, in accordance with a definite law, and this law can be used to calculate from the strength of a stick at one degree of moisture what its strength will be at any other degree.

Manufacturers, engineers, and builders need to know not only the strength but the weakness of the material they use, and for this reason they are quite as much interested in knowing how timbers are affected by moisture as they are in knowing how they are weakened by knots, checks, cross-grain, and other defects. It is obvious that where timbers are certain to be weakened by excessive moisture they will have to be used in larger sizes, for safety. So far, engineers of timber tests, while showing that small pieces gained greatly in strength, do not advise counting on the same results in the seasoning of large timbers, owing to the fact that the large timbers usually found in the market have defects which are sure to counterbalance the gain from seasoning.

The Forest Service has just issued a publication entitled "The Strength of Wood as Influenced by Moisture," in which are shown the strength of representative woods in all the degrees of moisture from the green state to absolute dryness, and the effects of re-soaking. This publication will be sent free upon application to the Forest Service, U. S. Department of Agriculture, Washington, D. C.

THE INTRODUCTION OF TOP MINNOWS INTO THE HAWAIIAN ISLANDS.

This publication comprises Press Bulletin No. 20 of the Hawaii Agricultural Station, and is written by D. L. Van Dine, Entomologist of the Station. It gives concisely an account of the successful introduction to Hawaii of the Top Minnows, the natural enemies of the mosquitoes and of their establishment in our waters.

MARKETING HAWAIIAN FRUITS.

Under the above title Mr. J. E. Higgins, Horticulturist of the Hawaii Agricultural Experiment Station, contributes Bulletin No. 14 to the publication of the local station.

For many years heavy losses have been entailed by shipping fruits to the mainland. These losses have so greatly increased of late that there has been a general tendency to can the greater part of the crop and some companies have entirely abandoned shipping fresh fruits to the coast.

An experiment was undertaken by the station in shipping Hawaiian fruits packed in different methods, treated in various ways, and subjected to the same conditions as other fruits in transit. In the above bulletin Mr. Higgins enters into a clear and exhaustive account of the results achieved by this initial experiment, by reference to which the Hawaiian grower may determine the way in which to market his product with most advantage.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

* Out of Print.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER *and* AGRICULTURIST

VOL. IV

NOVEMBER, 1907

No. 11

REPORT OF COMMITTEE ON FORESTRY.

The following is the report in full of the Committee on Forestry, presented by Mr. Thurston at the annual meeting of the Hawaiian Sugar Planters' Association:

The year 1907 has been one of progress and development in connection with forestry in Hawaii.

The forest reserve policy of the government has been steadily pursued, several important reserves having been added to those already existing. A detailed statement concerning what has been done in this respect will be submitted to the Association by Mr. Ralph S. Hosmer, the superintendent of forestry.

The year has been marked by a considerable increase in the number of persons who have taken advantage of the offer of the Board of Forestry to furnish free professional advice as to location of forest planting, kinds of trees best adapted to given localities and assistance in ways and means of establishing local nurseries and planting out trees. This interest has been especially manifested by plantation and ranch managers.

FOUR EVENTS IN FORESTRY DEVELOPMENT.

Four distinct matters relating to forestry have come to the front during this year, which are deserving of the attention of this Association. These are as follows:

First, a compilation and publication by the Federal forest authorities of statistics showing that the lumber forests of the United States, will, at only the present rate of consumption, last only about thirty years more, and that the hard wood supply of the United States is already practically exhausted, with a hard-wood famine, not only in prospect, but actually at hand.

Second, a definite formulation by the Superintendent of Forestry of Hawaii, in a report concerning a proposition to lumber the woods back of Hilo, Hawaii, of a policy concerning lumbering forests which are primarily needed as protec-

tion to water-shed as distinguished from a forest on an area from which there is no normal water flow; and the adoption of the policy so formulated by the Board of Agriculture and its approval by the Governor.

Third, the negotiation by the Hawaiian Mahogany Lumber Company, an Hawaiian corporation, of a contract with the Atchison, Topeka & Santa Fé Railroad Company, under which the former has undertaken to deliver to the latter something over 500,000 Ohia railroad ties per annum for the next five years.

Fourth, the demonstration, on a large scale, that Rubber grows well in Hawaii and can be made a profitable industry here; with the incidental effect that a large area will be planted up in rubber trees, which, from a forest protection of the land standpoint, are as good as any other variety of trees.

All of these four matters are of vital interest, not only to the citizens of the Territory of Hawaii at large, but especially to the sugar planters, as I will seek to hereinafter show.

Taking up the above subjects in the order named:

PINCHOT ON FOREST FAILURE.

FIRST. THE LUMBER SHORTAGE AND HARD-WOOD FAMINE IN THE UNITED STATES.

Gifford Pinchot, chief of the United States Forest Service, in an article published in *The Outlook* for October 12, 1907, makes the following statement:

After enumerating the statistics showing the amount of standing timber now in the United States; the present annual consumption and the present annual growth, he states:

* * * "The result shows a probable duration of our supplies of timber of not more than thirty-three years.

"Estimates of this kind are almost inevitably misleading. For example, it is certain that the rate of consumption of timber will increase enormously in the future, as it has in the past, so long as supplies remain to draw upon. Exact knowledge of many other factors is needed before closely accurate results can be obtained. The figures cited are, however, sufficiently reliable to make it certain that the United States has already crossed the verge of a timber famine so severe that its blighting effects will be felt in every household in the land.

"The rise in the price of lumber which marked the opening of the present century is the beginning of a vastly greater and more rapid rise which is to come.

"We must necessarily begin to suffer from the scarcity of timber long before our supplies are completely exhausted.

"It is well to remember that there is no foreign source from

which we can draw cheap and abundant supplies of timber to meet a demand per capita so large as to be without parallel in the world, and that the suffering which will result from the progressive failure of our timber was but faintly foreshadowed by the recent temporary scarcity of coal.

WHEN THE FORESTS FAIL.

"What will happen when the forests fail?

"In the first place, the business of lumbering will disappear. It is now the fourth greatest industry in the United States.

"All forms of building industries will suffer with it, and the occupants of houses, offices, and stores must pay the added cost.

"Mining will become vastly more expensive; and with the rise in the cost of mining there must follow a corresponding rise in the price of coal, iron, and other minerals.

"The railways, which have, as yet, failed entirely to develop a satisfactory substitute for the wooden tie (and must, in the opinion of their best engineers, continue to fail), will be profoundly affected, and the cost of transportation will suffer a corresponding increase.

"Water power for lighting, manufacturing and transportation, and the movement of freight and passengers by inland waterways, will be affected still more directly than the steam railways.

"The cultivation of the soil, with or without irrigation, will be hampered by the increased cost of agricultural tools, fencing, and the wood needed for other purposes about a farm. Irrigated agriculture will suffer most of all for the destruction of the forests means the loss of the waters as surely as night follows day.

"With the rise in the cost of producing food, the cost of food itself will rise. Commerce in general will necessarily be affected by the difficulties of the primary industries upon which it depends.

A SUICIDAL POLICY.

"In a word, when the forests fail, the daily life of the average citizen will inevitably feel the pinch on every side. And the forests have already begun to fail, as the direct result of the suicidal policy of forest destruction which the people of the United States have allowed themselves to pursue. * * *

"We are accustomed, and rightly accustomed, to take pride in the vigorous and healthful growth of the United States, and in its vast promise for the future. Yet we are making no preparation to realize what we so easily and glibly foresee

and predict. The vast possibilities of our great future will become realities only if we make ourselves, in a sense, responsible for that future.

"The planned and orderly development and conservation of our natural resources is the first duty of the United States."

MORE EXPERT EVIDENCE.

In a report on the timber supply of the United States, made by R. S. Kellogg of the Federal Forest Service in April, 1897, he makes the following statements:

"The lavish manner in which the United States has consumed the products of its forests and the rapidity with which our timber supply is melting away are wholly unappreciated by those who have never given the matter more than passing consideration. * * *

"Rapidly as the population of the United States has increased the lumber consumption has increased still more rapidly. In round numbers, the lumber cut in 1880 was 18 billion feet; in 1890, 24 billion feet, and in 1900, 35 billion feet. The increase in population from 1880 to 1900 was 52% but in lumber cut 94%.

"The original stand of white pine in the Northeast, is almost entirely cut out. The present stand in the Northeastern States is mainly spruce, second-growth white pine and hemlock. * * *

"It is well known that the days of white pine are rapidly passing and * * * it will in a few years cease to be a large factor in the timber supply of the United States.

SAW MILLS GO OUT OF BUSINESS.

"At the last annual meeting of the Northern Pine Manufacturers' Association in Minneapolis, Minnesota, the secretary presented the following statement:

"Since 1895, 248 firms, representing an annual output of pine lumber of $4\frac{1}{4}$ billion feet, have retired from business, due to the exhaustion of their timber supply. Plants representing approximately 500 million feet capacity which sawed in 1906 will not be operated in 1907."

"The amount of hardwood stumpage is rapidly decreasing. The hardwood cut in 1900 was 8 billion feet, in 1904, 6 billion feet, and the present annual cut of hardwoods is about 5 billion feet.

"As an instance of the timber shortage in the East it is stated that in New England 6 inches is now a common cutting diameter for white pine, while formerly, and where lumbering is intelligently done, 18 inches is the minimum limit.

"We are rapidly using up our forest capital. Our present annual consumption of wood in all forms is from three to four times as great as the annual increment of our forests. * * * Every indication points to the fact that under present conditions the maximum annual yield of forest products for the country as a whole has been reached, and that in a comparatively short time there will be a marked decrease in the total output, as there is now in several items. Neither is there any great supply of timber to turn to outside of the United States. With the exception of importations of small quantities of high-class woods like mahogany, the only promising source is Canada; but most of the timber there will be required at home. Even now Douglas fir (Northwest) is bringing higher prices in Canada than in American markets."

DR. FERNOW ON THE LUMBER SHORTAGE.

In February, 1907, Dr. B. E. Fernow, one of the leading forestry authorities in the United States, made the following statement in an article published in *Forestry and Irrigation* for February, 1907:

"One hundred and fifty years ago Germany found herself in very much the same condition as regards her forest resources as we are today in the United States—all accessible portions more or less culled, or in poor coppice, burnt over, and damaged by cattle, the valuable virgin timber mostly confined to distant and inaccessible locations. Sporadic attempts existed here and there at protection, at regulation of the cut, at conservative lumbering, and still more sporadic attempts at reforestation. * * * Yet until the beginning of the nineteenth century reduction of supplies without adequate reproduction proceeded, and around the year 1800 the wood famine had become acute, giving rise to the same kind of agitation and literature which we have experienced, even to bringing in the catalpa, and other such small rapid growers as the saviors of the nation.'

PROFITABLE FORESTRY IN EUROPE.

"The severity of the timber shortage in Germany at that time was temporarily relieved through increased production of coal and the building of railroads in hitherto inaccessible forest regions. Then came the vigorous organization of a settled policy of forest management, based upon the principle of sustained yield, or the cutting of the increment only, without lessening the wood capital. The results of this policy were that in Saxony the cut increased between the years 1820 and 1890 just 50%, and up to 1904 has increased by another 5%.

"In Prussia, in 1830, the cut was 20 cubic feet per acre, and in 1865 increased to only 24 cubic feet. In 1890 it was 52, and in 1904 it had grown to 65 cubic feet. Forest management increased the average acre production in 75 years more than threefold.

"Every acre of forest in Germany.—State, Municipal and private; good, bad and indifferent, productive and unproductive, now yields an average net profit of \$2.40 per acre annually, representing 5% on a valuation of \$50 per acre, and this is constantly improving.

"It must not be overlooked that these results have come largely from non-agricultural lands, the sandy plains, the swamps, the rough mountain slopes, and from forests which were mismanaged like ours.

"Can we expect to attain the same or similar results?

"We ought to do much better, for we have the hundred years of experience of our friends across the water to draw on and we can avoid many of the mistakes which they have naturally made and paid for."

HALL ON THE HARDWOOD FAMINE.

In the report by William L. Hall, assistant forester of the United States, on "The Waning Hardwood Supply of the United States * * *" dated September 24, 1907, and which has just arrived in Honolulu, he makes the statement that the cut of hardwood lumber in the United States decreased 15 per cent. between 1899 and 1906.

"This decrease took place during a period when American industries sprang forward at a pace unparalleled; when there was the strongest demand ever known for every class of structural material; when the output of pig iron increased 15 per cent., that of cement 132 per cent. and even that of softwood timber 15 per cent.

"That the decrease is due to diminished supply rather than to lessened demand seems to be proved beyond question. During the same period the wholesale price of various classes of hardwood lumber advanced from 25 to 65 per cent.; every kind of hardwood found in quantity sufficient to make it useful has been put on the market, and hardwood timber is now being cut in every State and every locality where it exists in quantity large enough to be cut with profit. These conditions could not prevail were the decrease in production due to a falling off in demand.

DECREASE OF HARDWOOD SUPPLY.

"Since 1899 the production of oak has decreased 36 per cent.; of yellow poplar, 37 per cent.; of elm, 50 per cent.; of cottonwood, 36 per cent. and of ash 20 per cent."

It is stated that the shortage is being made up by resorting to the inferior hardwoods, and, "although almost all possible new woods have been brought into use there has still been a shrinkage in the total output of 15 per cent.

"The supply in Indiana and Ohio, the original center of hardwood production, is practically exhausted. * * * In all of the States West of the Mississippi Valley the supply is small and can never become much of a factor. The impressive thing is that we are bringing hardwoods from far and near, and still the cut is going down.

"The southern part of Michigan, which originally bore magnificent hardwoods, was the first part of the State to be cleared. * * * The same is true of Wisconsin and Minnesota. The almost complete exhaustion of their timber supply, and the transformation of their hardwood lands into farms are apparently the only results to be expected. * * * In the Appalachian, as in the other regions, the hardwood lumbermen are working upon the remnants. The supply is getting short and the end is coming into sight."

ONLY SIXTEEN YEARS' SUPPLY LEFT.

Mr. Hall estimates that from the statistics of present supply of hardwood and present annual use of the same there exist in the United States today only sixteen years' supply.

He says that since 1898 the price of hard maple per thousand feet board measure has increased from \$20 to \$32.50 per thousand; of yellow poplar, from \$30 to \$53.50 per thousand; of hickory, from \$45 to \$65 per thousand, and of quartered white oak, from \$60 to \$80 per thousand.

Accompanying this increase in price has been a lowering of the standard.

Prior to 1907 the rules of the trade required even lengths, with a minimum length of 6 feet. In 1907 the Hardwood Lumber Association reduced the minimum to lengths of 4 feet and allowed odd lengths.

"IT EMPHASIZES THE FACT THAT WE ARE DOWN TO THE ROCK BOTTOM AND REQUIRE EVERY SOUND PIECE OF HARDWOOD LUMBER THAT CAN BE PUT UPON THE MARKET."

Between 1899 and 1906 the number of employes in the hardwood industry in Ohio decreased 40 per cent. and in Indiana 42 per cent.

An enumeration is given of the businesses directly depending upon hardwood, viz: Lumber, cooperage, furniture, vehicles, musical instruments, small wooden-ware, agricultural implements, cars, boxes and crates, railroad ties, telephone and telegraph poles and house finishing.

Mr. Hall concludes:

"The exhaustion of the hardwood supply means the loss of these industries to the States in which they are located. * * * How intensely the whole country would feel the loss of its hardwood timber * * * can scarcely be realized. * * * A general failure in crops may affect industrial conditions for a few years—a failure in the hardwood supply would be a blight upon our industries through more than a generation.

THE SITUATION IN BRIEF.

"The situation in brief is this: We have about a fifteen years' supply of hardwood lumber now ready to cut. * * * The inevitable conclusion is that there are lean years close ahead in the use of hardwood timber. There is to be a gap in the supply which exists and the supply which will have to be provided. How large that gap will be, depends upon how soon and how effectively we begin to make provision for the future supply. The present indications are that in spite of the best we can do there will be a shortage of hardwoods running through at least fifteen years. How acute that shortage may become and how serious a check it will put upon the industries concerned cannot now be foretold. That it will strike at the very foundation of some of the country's most important industries is unquestionable. This much is true beyond doubt, that we are dangerously near a hardwood famine and have made no provision against it."

After designating possible substitutes for hardwoods, such as metal, concrete and softwoods, Mr. Hall says:

THE ONLY PRACTICABLE SOLUTION.

"There seems to be but one practicable solution, and that is to maintain permanently, under a proper system of forestry, a sufficient area of hardwood land to produce by growth a large proportion of the hardwood timber which the nation requires. * * * The longer the delay in putting the forest under control, the longer continued and more extreme will be the shortage."

The foregoing statements are those of professional salaried experts, with nothing to gain by exaggeration, and are based upon statistics made with all the exhaustive resources of the United States Treasury.

These statistics are brought right up to the year 1907, and bring home to us, as nothing that I have yet seen does, the fact that not only forest protection but forest reproduction is of vital import to the sugar industry, as well as every other industry in Hawaii.

We have for years been unthinkingly cutting off our forests for firewood; devastating them with cattle; carelessly allowing their destruction by wild goats, and paying practically no attention to reforestation; while we have imported not only all kinds of both soft and hardwood, both manufactured and unmanufactured, for general domestic use, but have also been importing even our railroad ties, telephone poles and fence posts.

Within the year we have been brought up against the fact that not only have prices gone ballooning, but that even railroad ties and fence posts are hard to obtain even at the advanced prices. If prices of lumber in general, and hardwood in particular, are going to be prohibitory in the United States, where the material is produced, they are going to be more so here, where the added freight must be reckoned with.

THE REMEDY IN HAWAII.

What is the remedy?

There is and can be only one remedy. It is the same here that it is in the United States, and the same there that it was in Europe when they faced the same condition a hundred years ago.

The remedy is to stop unnecessary destruction of forests and immediately begin reforestation, both by protection of semi-forested areas, so that partly destroyed forests will return by natural means; and by replanting.

This should be done both through the medium of private effort and public appropriation.

It lies within the power of every sugar plantation and every cattle ranch in the Territory to, within the year, at an expense so small that it bears no comparison to the benefits to be derived, shut out cattle from every portion of the land which ought to be in forest, and, if no more is done, to plant along roadways, around house-lots, in gulches, waste land and on steep hill sides unsuitable for agriculture, trees enough to, within the next ten years, supply a very large proportion, if not the whole of the fence posts, railroad ties, telephone poles and firewood needed for consumption in the Territory.

RAPID GROWING HARDWOODS.

The few years during which there has been a skeleton of a forestry department maintained by the government in Hawaii has demonstrated that we have available a highly valuable assortment of rapid growing hardwood trees, such as a number of the varieties of the eucalypti, the iron woods, the silver oak and some of the acacias, besides that most valuable lumber tree, the Japanese pine.

We do not need any statistics or foreign expert advice upon this subject. The forestry experiments which have been carried on by the government on the ridges back of Honolulu; by the Lihue Plantation and George Wilcox on Kauai; by the Baldwin plantations; the Haleakala Ranch and by Captain Makee at Ulupalakua on the island of Maui, and by the Pacific Sugar Company on Hawaii, have already demonstrated what these trees will do.

RESULTS ON HALEAKALA RANCH.

As to what can be accomplished by continuous effort at small expense, I speak only as to my own knowledge in connection with the Haleakala Ranch on Maui, where, within the past seven years, at an expense of less than \$500 a year, there have been planted out and are now growing well about 60,000 trees, which are already beginning to yield timber for fencing and all necessary ranching purposes.

During the past summer on this ranch there were cut from thirty-three second-growth *rastrada eucalyptus* trees 230 good fence posts.

There is no reason why equally good results cannot be obtained almost anywhere on the islands.

Private work on forests is within the immediate control of individuals and corporations, but public work of this kind requires legislative appropriation.

REFORESTING APPROPRIATIONS NEEDED.

Up to the present time the Hawaiian Legislature has contented itself with appropriations for forest purposes barely sufficient to maintain a skeleton organization, without sufficient funds to take up the active work of reforesting.

To obtain appropriations for this purpose requires a public enlightenment and support from that portion of the community which recognizes the necessity of the situation.

There is no organization in the Territory which compares with the Planters' Association in power to bring to bear upon the legislature intelligent public opinion and influence.

I submit that not only should the Association pass resolutions to be presented to the legislature, in support of appropriations for reforesting, but that in their own interests, individual members should use their private influence in support of such a policy.

MEN AND METHODS ARE AVAILABLE.

The methods of propagation of tree seeds and of the young trees has been studied out and we are supplied with men who know just how it is to be done.

One of the ablest of these, Mr. Hawes, of the local Government Forestry Service, an educated forester, has spent the last twenty years of his life in studying the subject and his services are now available free to everyone, private, individual or corporation, who wishes the benefit of his advice on the ground as to what to do and how to do it.

All that is lacking is the desire to act and the carrying of the desire into effect.

SECOND. THE LUMBERING POLICY OF THE TERRITORY ON WATERSHED AS DISTINGUISHED FROM NON-WATERSHED FOREST AREAS.

The government owns a large area of forest land back of the Hilo District.

This forest contains large quantities of both Ohia and Koa timber.

This forest also is located upon one of the principal watersheds of the Territory, the entire town and District of Hilo obtaining their water supply from this source.

Early this year an application was made to the government for permission to cut timber from this forest.

The fact that, with the approval of the Superintendent and Board of Forestry, lumbering on a considerable scale in the Kau and Kona Districts of Hawaii had recently been approved, gave much concern to those interested in the Hilo water supply, for fear that consistency might require a like approval of lumbering in the Hilo District.

The Territorial Superintendent of Forestry, Mr. Hosmer, made an exhaustive study of the situation, and a report thereon to the Board of Forestry, recommending that the request be denied. The Board of Forestry adopted the reasoning and the recommendation of the report, and the Land Commissioner and Governor of the Territory have approved of the recommendation of the Board.

FOUNDATION PRINCIPLES INVOLVED.

I consider that the principles involved in the differentiation between the Hilo forest on the one hand, and the Kau and Kona forests on the other, lie at the foundation of the forestry question in this Territory, and, that if the policy as outlined in connection with this particular case can be established as the continuing policy of the Territory, it will far more than justify all the expense which the Forestry Department of the Government has heretofore caused, and be added cause for congratulation that the Territory has been so fortunate as to secure at the head of its Forestry Department an educated forester, representing the most advanced study and intelligence concerning the subject available in the United States.

Although the Forestry Department in Hawaii has not, as yet, much to show in the way of material returns, it is of immense advantage to the people of this Territory to have the principles upon which they should proceed, intelligently studied out on the ground and clearly expressed, so that the lay man may understand why it is good economy to lumber one section of the island forests and not to do so in another.

THE FACTS INVOLVED.

Mr. Hosmer's report brings out the line of demarcation between the watershed and the non-watershed territory so clearly, that all that needs to be further said in this connection is to make a few quotations from his report.

After describing the nature of the forested area, Mr. Hosmer says:

"All over the area are springs, pools and swamps that feed the various small tributaries to the Wailuku river and its several branches. Practically the whole drainage basin of this stream is on this land. * * * Very little is known accurately of the actual sources of the water in the streams or from which part of the forest they are most largely fed; but the indications are that from one-third to one-half of the water comes from the area of pure Ohia forest, while the remainder is the result of springs and swamps lower down. These springs are dependent for their sustained and equalized flow on the protection afforded by the forest cover. * * *

"Having given the problem thorough and careful study, both on the ground and in its various relations, I cannot report favorably on the proposition to lumber this tract.

"My principal reasons for this decision are three in number.

PROTECTION OF WATER FLOW.

"FIRST: I BELIEVE THE GREATEST VALUE OF THE FOREST ON PIIHONUA TO BE IN THE INFLUENCE WHICH IT HAS ON THE BRANCH OF THE WAILUKU RIVER AND ITS BRANCHES, I. E., ON THE EFFECT THE FOREST EXERTS ON THE WATER AFTER IT REACHES THE SURFACE, BY EQUALIZING THE FLOW AND PREVENTING EXCESSIVE RUN OFF.

"In view of use and possible further development for water power, irrigation and even for domestic supply—especially in connection with the growth of Hilo town—I regard the Wailuku as one of, if not, the most important stream protected by a forest reserve in the Territory.

"It might be possible, if the work were done under careful restrictions, to remove some of the mature trees from the Piihonua forest without detriment to its water conserving qualities; but to make lumbering profitable the operations would have to be conducted on a large scale. This would inevitably involve the opening up of considerable areas in sections where A COMPLETE FOREST COVER IS MOST NEEDED. Such a policy on this particular watershed would be fraught with danger. It is a risk which I do not believe the Territory should take; for the money to be obtained as stumpage would in no way compensate for the injury that would result were the regular flow of the Wailuku river seriously interfered with. * * *

UTILIZATION OF TIMBER.

"Second: The forest policy of the Territory has been, and is, to create a chain of forest reserves that are essentially 'protection forests.'

"ON THE LEEWARD SIDE OF THE ISLAND, WHERE, BECAUSE OF THE ABSENCE OF RUNNING STREAMS WATERSHED PROTECTION DOES NOT FIGURE, I AM IN FAVOR OF UTILIZING THE MERCHANTABLE TIMBER. BUT ON THE WINDWARD SIDE OF HAWAII I BELIEVE THAT THE FOREST IN THE SEVERAL ESTABLISHED FOREST RESERVES, SHOULD, FOR THE MOST PART, BE KEPT INTACT, AT ANY RATE FOR THE PRESENT. * * *

"Third: My third reason is from a professional standpoint.

"Forestry rests on a business as well as on a scientific basis.

"In the consideration of such a problem as the lumbering of the Piihonua forest, the factor of whether or not it would pay is an essential one.

"Even were it desirable that lumbering should be permitted, it would, in my judgment, be necessary, in order to safeguard the favorable conditions of stream flow that now exist, to load the contract with stringent regulations as to the area to be logged, the methods to be used and the subsequent treatment of the tract."

Mr. Hosmer concludes that in the instance under consideration these regulations would leave no margin of profit for the contractor, and that, therefore it would be unjustifiable to recommend foresting under conditions which could not result in profit.

THE IMPORTANT FEATURE.

THE IMPORTANT FEATURE IN THE POLICY EMPHASIZED BY THE FOREGOING REPORT IS THE RADICAL DIFFERENCE BETWEEN THE FORESTS WHICH ACT AS A REGULATOR OF THE FLOW OF WATER AND FORESTS FROM WHICH THERE IS NO WATER FLOW.

Whether forests affect climate, especially rainfall, or not, is a disputed point.

My personal belief, based on personal knowledge of a large part of this Territory, is that it does have a strong effect thereon in many parts of this Territory.

There is, however, no dispute, and can be no dispute that a thick forest cover not only helps, but is absolutely essential to the maintenance of an even flow of water from a given water producing area.

I go further and claim that a forest on a water producing area in this Territory, with its heavy rainfalls and short watersheds, is absolutely essential to any economical flow of water at all.

HAWAIIAN WATERSHEDS ARE SHORT.

The Hawaiian streams, which furnish water for irrigation and other economic use, all rise in forest areas with watersheds of from five or six to less than thirty miles in length.

It requires no scientific study or reasoning to demonstrate that water flowing upon an area of land averaging not over 12 to 15 miles in length and on a grade of from 5 to 50 per cent., will not hold water for more than a few hours after rainfall has ceased, unless there is not only a forest, but a thick jungle of ferns, moss and debris to prevent its rushing in a torrent to the sea.

The forest is not enough under such circumstances. There must be a subsidiary growth of small trees and shrubs; under that a growth of ferns and creeping vines and in addition to that an undisturbed matting of leaves, sticks and moss creating a mass of material so thick as to hamper and almost prevent the flow of water. Once a clearing is made sufficient for the water to wear a course for itself and the heavy torrential rains, with the steep grade, will cut innumerable water courses to the sea, denuding the land of soil and draining off the water supply.

The almost constant standing water and semi-swampy condition existing in Hawaiian water-producing forests is essential to the very existence of this character of forest, as the existence of this character of forest is necessary to the con-

servation of the water supply. Neither can exist without the other.

Under these circumstances, any radical interference whatsoever with any portion of the forest immediately sets in motion a train of events which eventually destroys the whole.

In other words, it is my firm conviction, based upon fairly close observation extending over the last thirty-five years, that the forest growth on the water-producing watersheds of Hawaii must be, as far as possible, absolutely closed to interference, either by man or beast, or the result will be, in spite of all effort to the contrary, a doubly reacting disintegration of the forest, and diminution and final destruction of the area as an economic water-producing source.

NON-WATER PRODUCING FORESTS.

In marked contrast to this, as brought out by Mr. Hosmer's report, is the Hawaiian forest which does not cover a water-producing area.

Here there is no water flow to complicate the question.

There is not only no water to conserve, but the natural growth of the forest, being more open, does not require the careful protection which the forest growing in a semi-swamp does. The undergrowth is hardier and recovers more easily than it does in the water-soaked section.

With proper care, the mature trees can be removed, not only without radical damage to the remaining growth, but to the advantage of the younger growth; and by opening up the under vegetation, gives opportunity for seeds to start and saplings to reach the light, which otherwise would fail to germinate or die for lack of room.

It becomes simply a question of intelligent lumbering; the making of the forest a revenue-producer through the medium of lumber instead of through the medium of water.

The principle involved in both cases is the same, viz: the causing the soil to produce that which will be the most value to mankind. In the water-producing area that which can be produced of most value is water. In the non-water producing forest that which can be produced of most value is timber.

How to intelligently lumber forests, is a question which has had expert study of a high class in most European countries and to which great attention is now being paid in the United States. There is no mystery about it. It simply consists in intelligent application of common sense to local conditions. This has been done in Europe and is being done in the United States. It has practically never yet been done in Hawaii.

WHAT FOREST RESERVES MEAN.

Popular opinion in Hawaii largely conceives of a forest reserve, as an area which is locked up and removed from profitable enterprise.

As a matter of fact, in the case of water-producing forest, it is a devoting of the land to the production of that which is of the most value to the people of the Territory, viz: water.

In the case of non-water producing forest, it means, not locking up from profitable use, but protecting the forest from destructive agencies, so that it can be made profitable, which now it is not, and, with a few exceptions, never has been; and, unless the methods of lumbering and reproduction evolved by study in Europe and the United States are applied here, never will be.

In other words, the most valuable crop which can be produced in a water bearing forest, is water. The most valuable crop which can be produced in a non-water producing forest, is timber. Whatever will most effectively accomplish these results in the respective cases, is in the public, as well as private interest, and should be done.

THE MAHOGANY LUMBER COMPANY.

(3). THIS NATURALLY BRINGS US TO THE CONSIDERATION OF THE EXTENSIVE OPERATIONS NOW BEING UNDERTAKEN, BY THE HAWAIIAN MAHOGANY LUMBER COMPANY.

The proposition that Hawaii possesses forests which can produce railroad ties by the million, has come as an intense surprise to all but a very few in Hawaii.

The fact that ties can be produced and exported at a profit has come as a surprise to everyone. The only possible explanation thereof is the practical lumber famine which is now upon the United States and so graphically described in the official reports above quoted from. This shortage has for the first time made it possible to bring home to the people of Hawaii, in cold dollars and cents, that forest production and lumbering can be made an important industry in this Territory.

The fact that nearly three million standard railroad ties are to be exported from the Territory within the next five years has produced much solicitude and adverse comment among those who have not studied the question. Within the past month I have repeatedly heard the statement made that this contract was a bad thing for the Territory as it would not only denude the forest but exhaust the entire local supply of timber.

WHERE THE TIMBER WILL COME FROM.

So far from this being the case, the fact is that almost this entire contract will be filled with timber cut from the arable lands of the Olaa and Puna Sugar Companies, which, in ordinary process, they are clearing for the cultivation of sugar cane.

Heretofore the timber cleared from similar lands has been removed at large expense and burned on the ground to get rid of it.

Under this contract the timber will be removed at no expense to the plantations and a handsome stumpage will be paid to them instead.

Just how much more Ohia there is available for lumbering cannot now be definitely stated, without much more careful examination than has heretofore been given to the subject, but it is entirely conservative to say that there is ten times as much more available Ohia as that involved in this contract without in any way interfering with water conserving forests.

Comparatively little of the Ohia forest available for lumbering is suitable for cultivation. The great bulk of it is on land so rocky or so steep, or at such elevations as to make agriculture impracticable for any products now known to be profitable.

In consequence of this fact the great bulk of the Ohia forest land will continue to be forest land. Whether they will continue to produce only Ohia timber is a question which the future must determine, after intelligent study by forestry experts has been given to the subject. It may very well be that it will pay to substitute the slow growing Ohia tree, as the mature Ohia forest is removed, with the quicker growing hardwood trees which are so easily propagated here.

NO FEAR OF FOREST DESTRUCTION.

The people of Hawaii need have no fear that the present move to make valuable the heretofore waste forests of Hawaii, is a move toward denudation of the forest and the carrying on of the policy of forest destruction which has heretofore prevailed so generally.

The one railroad tie contract above referred to means that there will, within the next five years, be brought into this Territory approximately two and one-half million dollars in gold coin which, but for that contract, would never have come here.

It means that this contract will demonstrate that lumber production can be made one of our leading industries. This is with the proviso, however, that such lumbering is done under intelligent supervision and is followed up by intelligent

care of the area lumbered, looking toward the protection of the young trees remaining and the propagation of additional trees.

The outlook is full of hope in this connection, for the operations of the Mahogany Lumber Company, not only in connection with its lumbering of Ohia ties, but of the Koa forests, is being consistently carried out, both on the part of the forest owners and of the lumbering company, under the direct supervision and advice of the Superintendent of Forestry and subject to the rules and regulations of the Board of Forestry.

THE RUBBER INDUSTRY.

(4). THE RUBBER INDUSTRY AS RELATED TO FORESTRY.

Systematic rubber planting in Hawaii as an industry was begun three years ago, but until this year there have been no systematic tapping of trees and keeping of statistics of yield, on which to base commercial calculations of the profitableness or otherwise of the business.

During the past year under the direction of Jared Smith, chief of the Federal Agricultural Experiment Station in Hawaii, a number of mature rubber trees growing in the Territory have been tapped and statistics kept of the yield. The results are not yet available for publication but sufficient has been learned to make it certain that rubber production will be profitable in this Territory under existing conditions.

This fact has been accepted to the extent that there are already five incorporated companies planting rubber on a considerable scale, besides a large number of individuals planting on a small scale. There have already been planted in the Territory between five and six hundred thousand rubber trees. The first tapping on any scale will take place next summer.

FORESTRY AND THE PLANTERS' ASSOCIATION.

From the standpoint of a profitable industry there is great hope in rubber, especially as, although the trees require good soil, they can be grown to advantage in patches scattered through the many small valleys which are found in all the mountain sections of the Territory. The business will therefore not only be of value in creating a new profitable industry, but will incidentally assist in reforesting the islands, especially where, by reason of inaccessible or smallness of area, it probably would never pay to plant for lumbering purposes.

Intelligent advice should be sought as to where and when to plant rubber trees, as they will not grow well at either the

elevations or under rainfall conditions where many other trees will do finely.

There are unquestionably, however, large areas which are unfit for general cultivation, which should be reforested, and where rubber trees will do as well, and be more profitable, than any other tree which can be planted there.

The local Federal Agricultural Station has issued bulletins upon the subject of rubber culture and is about to issue another one.

The Territorial Agricultural Forestry Department has also interested itself in the matter; is furnishing rubber seed at approximately cost to all who desire it, and is prepared to give expert advice and suggestions as to locations and methods of planting.

RUBBER AS INCIDENTAL TO SUGAR.

There is no reason why, incidentally, a number of sugar plantations, especially those in the non-irrigated windward districts, should not, at slight expense, plant large numbers of rubber trees in gulches and other localities unsuitable for cane, resulting in a benefit by present reforestation; and ultimate profit from the rubber product which, if present prices prevail and the expectations of those who have made a study of rubber are fulfilled, will eventually be greater per acre than is even sugar.

The concrete results of next year's tapping of the trees at Nahiku will be watched with eager interest by all interested in the development of Hawaii.

RUBBER AS A REFORESTING AGENT.

Altogether 1907 has been a memorable year in the history of forestry and forest products in Hawaii. Whether the events of the year shall be taken to heart and made available for the beneficial progress of the Territory, either through the medium of public or private enterprise, depends largely upon the intelligence and energy of the members of this Association.

In the past the subject of forestry has been largely treated by this Association as an interesting incident, but not as one of direct concern or of possible immediate benefit or profit to its members. Within two years I have heard of trees bounding fields being cut out because the shade injured the adjoining cane.

In all earnestness I urge upon the Association that the time for this view of forestry and its possibilities in Hawaii has past, and that the preservation, propagation and utilizing of

forests and forest products should from this time forth be made one of the leading features of the efforts of the Planters' Association, both by it as an organization, and through the individuals and corporations which give it its strength.

Respectfully submitted,

LORRIN A. THURSTON,

Committee on Forestry.

NEW FRUIT MARKETS.

The following letter by Mr. Jared Smith, is copied from a recent Advertiser:

Editor Advertiser: Mr. J. E. Higgins reports, under date of September 4, 1907, the arrival in Chicago in perfect condition, of our pineapples and avocados. This carload of fruit left Honolulu per Alameda, August 14, and arrived in Chicago late Saturday afternoon, August 31. The following Monday being Labor Day, the fruit was not opened for examination until September 3. Mr. Higgins states that out of the whole lot of pineapples sent, he had discovered, so far, only one defective fruit. A consignment of twenty-two dozen avocados which accompanied the pineapples, arrived in Chicago in good condition for immediate use.

This is a practical demonstration of the fact that pineapples and alligator pears can be shipped in good condition to any market which can be reached from Honolulu in twenty-one days, either by ocean or rail transportation. With the present lines of communication, this would include all mainland points between San Francisco and Chicago, all northern ports as far as Sitka, all Japanese ports, Vladivostok, Hongkong, Sydney and Melbourne. Those who engage in the pineapple industry in Hawaii need have no fear of producing a larger crop than can be marketed at present prices for many years to come.

Yours truly,

JARED G. SMITH,

Special Agent in Charge.

Hawaii Agricultural Experiment Station, Honolulu, Sept. 19, 1907.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

ROUTINE REPORTS.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

October 30, 1907.

Gentlemen:—

I have the honor to submit the following report covering the routine work of the Division of Forestry from July 29, 1907, to date.

During this period my own time has been taken up as follows: The first part of August was devoted to various routine matters connected with the work of the Division. Practically all of the time since August 20 I have been in the field, on trips to the other islands having to do with forest reserve projects, forest inspection and examinations of forest lands belonging to private corporations and individuals; the last under the offer contained in Circular No. 1 of this Division, wherein the Division agrees to give advice and assistance to owners of forest land in the management of their properties, according to the methods of forestry.

MAUI.

From August 20th to 31st I was on Maui, making an examination of the forest planting now going on on the lands of the Alexander and Baldwin interests, in several localities near Haiku; in an inspection of a portion of the proposed Makawao Forest Reserve, where there is a question of forest planting; in a visit to the rubber plantations at Nahiku; and in an examination of certain problems in the Koolau Forest Reserve. At Nahiku I saw in some detail the groves of the several plantations and discussed with the different managers various matters in connection with rubber growing.

Rubber at Nahiku.

So far as the growth of the trees goes the outlook at Nahiku is most promising and from all present indications a satisfactory yield of latex seems assured. The problems of finding the best method of tapping and harvesting the rubber, involving as they do the training of skilled workmen, now loom large, but I am

confident that a satisfactory solution will be found when the matter receives careful attention. With the trees growing at the present rate it will not be long before the older groves will be large enough to permit systematic experiments to be begun.

MOLOKAI.

Returning to Honolulu for a few days I was again away from September 3rd to September 8th on a trip to Molokai. This, my first visit to that island, gave me the opportunity to inspect the private forest reserve that has for a number of years been maintained on the central mountain of Molokai by the American Sugar Company; to investigate the question of the best method of handling the Algaroba forest to meet the varying demands of honey production, stock feed and utilization for fuel; and in general to get in touch with the conditions existing on the western half of that interesting island.

KONA, HAWAII.

On September 10th I started on the trip from which I have just returned. Going first to the Kona District on Hawaii I made as thorough an inspection of the forested area from Mt. Hualalai to the Kau District line as is possible, without the cutting of numerous and expensive trails through the forest. Using existing trails through the woods as a basis I made a general examination of the forest as a whole; including both government and private forest lands.

On this basis I am prepared to make recommendations for the government land, as well as to the several owners, as to methods of managing this area, in accordance with the principles of forestry. Such reports are now in preparation; they will later be brought to the attention of the Board.

The Forest Question in Kona.

In this connection it seems to me appropriate to repeat the statement, made in former reports of mine, that the forest question in this Territory has two very distinct aspects. On the windward side of the islands, especially Hawaii and Maui, in districts where there is living water in springs, brooks or streams that is either made use of locally, or impounded for the irrigation of lands more or less near at hand, the forest is mainly important as a protective cover, and as such should be kept as nearly intact as may be. On the leeward side of the islands, on the other hand, where the only living water is found in occasional springs, a different treatment is indicated. Here the forest, excepting always such areas as may be necessary to protect the liv-

ing water that does exist, is and ought to be considered in relation to its commercial value.

So in the Kona District, having carefully studied the situation on the ground, I am in favor of lumbering the mature trees, both Koa and Ohia, for I believe that if the work in the woods is properly done and the areas cut over are handled subsequently in an intelligent way, not only will a valuable industry be added to the Territory, but also that the forests themselves will be in better condition than at present.

Over considerable areas in Kona the large Koa trees are dying and in a few years will cease to have value either as a forest cover or as commercially important wood. The wise thing is to utilize this material while we may and then to manage the land on which it grew for the purpose for which it is best adapted. Some of the land now nominally under forest is unquestionably of greater value for grazing. Part of it can best be used for growing trees. The problem presented is to put it all to its best use, with due regard not only to strictly utilitarian use, but also to the indirect benefits which may result to the district from having a considerable body of forest on its mountain slopes. These points will be brought out in detail in my reports on the Kona lands.

Experimental Tree Planting.

Following my visit to Kona I spent three days at Waimea, selecting on the slope of Mauna Kea, several plots where can be carried on the coöperative tree planting experiments for which the U. S. Forest Service has recently supplied the funds. The areas selected are five acre plots on the unleased government land of Kaohe, at elevations of respectively 7,500, 9,000 and 11,000 feet. Here it is proposed to plant pines, spruces and firs from the temperate zone, with the expectation of finding a valuable tree that will grow on the higher slopes of our mountains, above the native forest. Similar experimental plots were also selected on the slope of Mt. Haleakala on Maui, as a part of my work on that island.

MAUI.

On October 4th I went over to Maui, remaining on that island till my return to Honolulu on October 24th. My visit to Maui consisted in a careful examination of the forest question in the Districts of Kula, Honuaula, Kahikinui and Kaupo, particularly in relation to government lands that are unleased or on which the leases will soon expire; in matters connected with the protection by a forest cover of the area adjoining the Waihou Spring on the government land of Makawao (Haleakala Tract); in the selection mentioned above of areas for experimental tree planting; and in an inspection of the tree planting work now being carried on by the Haleakala Ranch. Taking advantage of being

within easy reach I attended the Rubber Growers' meeting at Nahiku on October 12th, visiting some additional groves that I had not seen on my earlier trip and taking a part in the establishment of the Hawaiian Rubber Growers' Association. On the several questions investigated on Maui I shall in due course submit detailed reports to the Board.

ROUTINE MATTERS.

During the past three months the most important routine work in the Division of Forestry has been the exchange of seed with botanical gardens and other corporations and individuals in various parts of the world. Seed of many valuable trees and plants, new to the islands, have been received and are now being propagated in the Nursery.

Perhaps of the greatest present interest are two new species of rubber trees from Brazil, sent from Germany. They both belong to the genus *Manihot*, of which the Ceara rubber, so well known locally, has heretofore been considered the only rubber-producing species. Plants have been started at the Nursery and sent to Nahiku for trial. As is usual at this season of the year many trees and plants have recently been furnished to the schools for Arbor Day planting.

Nursery Grounds.

Thanks to the Superintendent of Public Works the work of improving the Government Nursery grounds is progressing favorably. Over 900 yards of earth have been hauled in to fill up the low lying part of the grounds and additional lots are daily being added. When the present improvements are completed the grounds will be in a more satisfactory condition than at any time in their history.

The new laboratory of the Division of Animal Industry was completed in September, and is now ready for occupancy.

Meetings.

The library room of the Board continues to be used for evening meetings of various organizations. Since July 29th the list is as follows:

Hawaiian Entomological Society, August 8th.
Hawaiian Poultry Association, September 10th.
Kaimuki-Palolo Improvement Club, October 25th.
Hawaiian Entomological Society, October 3rd.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, October 30, 1907.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.
Gentlemen:—

Since my report to you, dated the 2nd instant, there have arrived twenty-five steam and sailing vessels from outside the Territory requiring inspection by this Department.

On October 3rd the S. S. "Hilonian" arrived from San Francisco and on board were found four crates of turnips infested with the larvae and pupae of the raddish-cabbage root maggot (*Phorbia brassicae*). These vegetables, including the cases, were destroyed by fire.

On the 7th of October the S. S. "Sierra" brought from San Francisco five cases of quince badly infested with codling moth larvae (*Carpocapsa pomonella*). This is not a new pest for that fruit but, as the quantity of worms found made the fruit practically worthless, the consignment was burned.

On October 11th the S. S. "Nippon Maru" brought 110 packages of rubber seeds, some of which had been damaged and were found to be swarming with a species of mite. The seeds were treated with the fumes of carbon bisulphide. Mites, as a rule, are difficult to destroy, but with the above chemical these succumbed readily in the course of an exposure of about two hours. The same chemical was again used in the disinfection of some infested imported Japanese rice.

Consignments of lemons and other fruits from Australia were ordered sent out of the Territory on account of the danger of introducing the fruit flies of that country.

Since my last report I have received an interesting letter from Mr. Geo. Compere, who is at present in India collecting beneficial insects for Western Australia and California. Mr. Compere has again succeeded in securing parasites upon fruit maggots, one species of which pest was introduced in the Territory some years ago, and has since practically wiped out the formerly profitable melon crops of these islands. Among the parasites secured by Mr. Compere, and being bred in India by him for introduction into West Australia, is one on cucumber, which will no doubt be beneficial to us here when introduced and established. Mr. Compere is meeting with many difficulties owing to distance in transportation, but states that he will this time be successful

in introducing these parasites into Western Australia, after which, in course of time, it will be easy for us to get them from the latter country.

This department has made another inspection of the young mango trees that have been propagated from imported Indian mango varieties, and has found them free from the "mango scale" (*Coccus mangiferae*) about which I previously reported. This is very satisfactory and it is hoped that parties who have purchased, or have been presented with trees of the above varieties, will notify the department so that we may make a free inspection of these and disinfect them if necessary.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

NOTES FROM THE REPORTS OF THE FOREST NUR- SERYMAN.

(October 2 and 30, 1907.)

PROPAGATION AND DISTRIBUTION OF PLANTS.

Owing to the large amount of seed which we are receiving in exchange for seed sent out some time ago, a large number of plants new to the Territory are being experimented with. The propagating house although small, is of great service in this work and it is kept full all the time. The demand for forest trees is increasing and a number of people have been making inquiries regarding the best trees to plant, methods of planting, etc. A number of orders are on file for large quantities of forest trees. Those are mostly from people in the neighborhood of Honolulu, and on this island. People on the other islands who want to do much planting are advised to grow their own trees; all instructions in propagating and planting being given and seed supplied at cost of collecting.

COLLECTING AND EXCHANGE OF SEED.

The collecting of seed has been continued. Our seed exchange list now numbers over 100 Botanic Gardens and other Institutions. The correspondence in connection with this work is taking up much of the writer's time. The demand for seed of the indigenous plants of the islands by the different Botanic Gardens is large. We are trying to get together all the native seed of

any consequence to be used for exchange purposes. Seed has been received as follows in exchange for seed sent out by us some time ago:

3 packages from Yokohama Nursery Co., Yokohama, Japan.			
31	"	"	Botanic Gardens, Hobart, Tasmania.
32	"	"	Botanic Gardens, Melbourne.
11	"	"	Botanic Gardens, Mysore, India.
14	"	"	Public Grounds & Plantation, Jamaica.
19	"	"	Public Works, Island of Guam.
2	"	"	Royal Botanic Gardens, Berlin, Germany.
177	"	"	Royal Botanic Gardens, Calcutta.
67	"	"	J. Staer, Seedsman, Wahronga, Australia.
27	"	"	Botanic Gardens, Straits Settlements.
37	"	"	Royal Botanic Gardens, Ceylon.
1	"	"	T. F. Sedgwick, Lima, Peru.
77	"	"	Botanic Gardens, Saharnpur, India.
4	"	"	Botanic Gardens, Aburi, Accra Gold Coast.
120	"	"	Botanic Gardens, Buitenzorg, Java.
8	"	"	Botanic Station, Uganda, British East Africa.

The most important consignment of seed received so far consists of two new varieties of the rubber-bearing *Manihot*, sent from the Royal Botanic Garden at Dahlem, near Berlin, Germany. In a letter from the Director, received Sept. 3, 1907, he has the following to say regarding the seed: "I beg to send with this the seed of two species of *Manihot* from the State of Bahia, Brazil. For the present one of these may be designated as *Manihot* from Jejuie, the other *Manihot* from Piauhy. Both are new species that should be immediately described under their scientific, botanical names. Both produce rubber." Previous to this introduction we have only had one species of rubber-bearing *Manihot*, namely *Manihot glaziovii* (Ceara rubber). Both new kinds have been started in the propagating house and are making a vigorous growth.

ADVICE AND ASSISTANCE.

A report with planting plan has been completed for the Hawaiian Fibre Co., Mr. Wm. Weinrich, Manager, for the land of Lower Pauhala, in Waikele, Ewa, Oahu. The whole tract contains approximately 2,000 acres and the land to be planted in trees about 400 acres.

WEED EXTERMINATOR.

A mixture of six pounds of white arsenic, five pounds of caustic soda and one gallon of water, is recommended for keeping street gutters and car lines free from weeds.

FOREST NOTES OF OTHER COUNTRIES.

From Practical Forestry.

In France, at Perigord, oak forests are planted for the truffles which grow upon their roots. It is said that three million dollars' worth of the fungus is annually exported.

In Italy acres of olive, walnut, willow and mulberry trees are grown in the fields, between which grain and potatoes are planted. The trees are pollarded and serve as props to grapes vines. The willow twigs are used to tie up the vines and the mulberry leaves furnish food for silkworms.

In Mexico rubber is grown as a shade to coffee.

Saxony, in Germany, with a population of three and a half millions and an area of nearly six thousand square miles, devotes more than a quarter of its land to productive forestry. The tree most grown there is spruce.

The swampy lands of Gascony were practically reclaimed by tree culture which added a new province to France.

In many countries of Europe willow trees are grown along the innumerable streams and ditches, and do double duty. The roots are useful to bind the banks and prevent the incroachment of the water, while the branches yield withes for basketry and the wood is used for sabots.

ARBOR DAY PROCLAMATION.

In accordance with custom, I hereby designate Friday, the 15th day of November, 1907, as Arbor Day for the Territory of Hawaii, and recommend that on that day appropriate exercises be held in all the schools of the Territory and that a part of the day be devoted to the planting of trees and shrubs.

Given under my hand and the Great Seal of the Territory of Hawaii at the Capitol, in Honolulu, this 31st day of October, A. D. 1907.

(Seal)

W. F. FREAR,
Governor of Hawaii.

By the Governor:

E. A. MOTT-SMITH,
Secretary of Hawaii.

NEW PUBLICATIONS.

FARMERS' BULLETIN 287.

Poultry Management. By G. Arthur Bell, Assistant Animal Husbandman, Bureau of Animal Industry. Pp. 48, figs. 14.

This bulletin deals with chicken raising, containing suggestions and directions for construction of poultry houses, selection of breeds, treatment and care of chicks and capons, remedies for diseases and bad habits of the fowls, methods of preserving eggs, etc. It is designed to supersede Farmers' Bulletins 41 and 141, entitled "Fowls: Care and Feeding" and "Poultry Raising on the Farm," respectively.

FARMERS' BULLETIN 298.

Food Value of Corn and Corn Products. By Charles D. Woods, Director, Maine Agricultural Experiment Station. Pp. 40, figs. 2.

History of the maize plant, with studies on the digestibility and food value of this cereal in its various uses. Corn breakfast foods, pop corn and green corn receive attention, and the use of raw corn and parched corn are considered. Milling and cooking are also features of the bulletin.

FARMERS' BULLETIN 304.

Growing and Curing Hops. By W. W. Stockberger, Expert, Drug-plant Investigations, Bureau of Plant Industry. Pp. 39, figs. 20.

This Bulletin gives the climatic and soil conditions essential to successful hop growing, directions for propagation, cultivation, pruning, training, picking, curing, and baling, with a statement as to cost and yield of crop, and suggestions for marketing.

FARMERS' BULLETIN 306,

Dodder in Relation to Farm Seeds. By F. H. Hillman, Assistant Botanist, Bureau of Plant Industry. Pp. 27, figs. 10.

Character and varieties of the dodder plant, its preference for certain host plants, kinds of seeds infested, relation to seed trade, directions for detection, description and illustrations of seed, buying and cleaning of clover and alfalfa seeds, detection and destruction of plants in the field, etc.

FARMERS' BULLETIN 308.

Game Laws for 1907. A Summary of the Provisions Relating to Seasons, Shipment, Sale, and Licenses. By T. S. Palmer, Henry Oldys, and Chas. E. Brewster, Assistants Biological Survey. Pp. 52, figs. 4.

PUBLICATIONS, BUREAU OF ANIMAL INDUSTRY.

CIRCULAR 24.

The Man Who Works with His Hands. Address of President Roosevelt at the Semi-Centennial Celebration of the Founding of Agricultural Colleges in the United States, at Lansing, Mich., May 31, 1907. Pp. 14.

CIRCULAR 112.

Relative Proportions of the Sexes in Litters of Pigs. By George M. Rommel, Animal Husbandman. P. 1.

CIRCULAR 113.

Classification of American Carriage Horses. Pp. 4.

AGRICULTURAL NOTES.

HERD OF BULLS.

The finest herd of blooded cattle that has ever been imported to Hawaii was brought by a recent Hilonian. The herd consists of thirty-three bulls consigned to the Parker Ranch, the American Sugar Company Ranch and to John Hind. The animals were selected by Mr. Fred. L. Carter and consist of pure-bred Herefords, Shorthorns and Devons.

POULTRY SHOW.

The Farmers' Institute of Hawaii will again unite with the Hawaiian Poultry Breeders' Association in making a general agricultural exhibition in connection with the December Poultry Show. It is hoped that Forester readers will assist in the success of this enterprise by contributing exhibits of fruits, flowers, vegetables, poultry and other produce.

THE ALGAROBA.

The great value of the algaroba is illustrated by the condition of a tract of land between Kihei and Maalaea Bay. Maui, which some years ago was so sterile as to be valueless. Application has now been made for its opening to settlement by a number of native Hawaiians, who wish to devote it to agricultural purposes. The improvement in the land is solely due to a growth of algaroba with which it has become covered.

WEED KILLER.

Application for patenting an invention which should prove of great value to sugar planters has lately been made by Mr. T. J.

Ryan of Hawaii. The proposed machine is intended to burn away weeds by means of a series of burners operating below the body of the apparatus.

PINEAPPLE EXPORT.

The largest shipment of canned pineapples ever made from this Territory was dispatched on the Hilonian which left Honolulu on November 6th with 20,300 cases. The total value of the consignment was about \$80,000, and it is confidently predicted by growers that within the next few seasons shipments of this size will be frequent.

REFINED SUGAR.

The manufacture of refined sugar upon the plantations is gaining in popularity. The practice has lately been adopted at Aiea which has produced a most excellent article from its new refinery.

TAPIOCA.

Mr. J. W. Conradt is reported to be about to establish a small factory in Hamakua for the manufacture of tapioca starch. It is intended to construct a small mill capable of producing one ton of tapioca a day. Tapioca starch is by many preferred to corn starch for culinary purposes and is also of great value in the laundry.

HONOLULU ENTERPRISE.

The Honolulu Iron Works has for some time been engaged in the manufacture of three complete sugar mills for operation in Formosa. The first of these is already nearly installed, and will be ready for operation early next year. The new plant has a capacity of 65 tons of sugar per diem and is complete in every detail. The remaining plants will have capacities of 150 and 120 tons of sugar daily, respectively.

CATTLE.

The supply of cattle upon the various island ranches is said to be in excess of the present market demand.

RAILWAY EXTENSION.

The Kona Agricultural Company, the Kona Development Company and the West Hawaiian Railway Company have together authorized an issue of \$1,000,000 of bonds for the purpose of railroad extension. The road will be used for the conveyance of passengers and freight and also for transporting sugar cane to the mill of the Kona Development Company. Thirty-two miles of track are already in operation and the new extension, which will permit seaport connection at Kealahou Bay, will greatly extend the possibilities of the development of North and South Kona.

HAWAIIANS AS AGRICULTURISTS.

The native Hawaiians on Maui, encouraged by the good prospect of the rubber industry are engaging in this new enterprise. Many of them have also commenced to cultivate pineapples and grapes with every promise of success. The development of these industries among the Hawaiians is in part due to the exemption from taxation of land devoted to new industries and also to direct encouragement by local planters. The attempt to induce the Hawaiians to return to the pursuit of agriculture is a most praiseworthy one and its beneficial influence should be most marked.

FRUIT TRADE POSSIBILITIES.

The extraordinary possibility of the development of the Hawaiian export fruit trade may be in some measure gauged by the fact that the port of Celba, on the north coast of Honduras, a town about one-sixth the size of Honolulu, dispatches some twenty steamers of tropical fruit monthly to New Orleans and Mobile. The demonstration which has lately been made of the practicability of shipping pineapples and other Hawaiian grown fruits in good condition to Chicago, has opened up the whole of the western and middle States to our trade. The extension of our export fruit trade must follow as a matter of course, and during the next few years this will rank as one of the most important factors in the development of Hawaii.

RUBBER SEEDS.

The Nahiku Rubber Company has recently received a shipment of 210,000 Hevea rubber seeds. Of these 5,000 are to be planted at Koolau, 10,000 in Honolulu for experimental purposes, and 190,000 are to be planted at Nahiku.

BRAZIL RUBBER EXPORTS.

A Consular report, just published, from Para, states that last year the amount of rubber exported reached a total of 35,000 tons. The increased demand kept the prices high, and it is expected that the present level will be maintained, as the output of rubber from other countries has not affected the Brazilian qualities.

TO RECOVER WASTE RUBBER.

A process is in operation in France, whereby it is claimed all the effective rubber can be recovered from "perished" rubber. The process is said to be not expensive, and to fully repay its cost.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugha, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

* Out of Print.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. IV

DECEMBER, 1907

No. 12

One of the most important works before the economic botanist in Hawaii is the compilation of a popular treatise upon the imported and native weed plants of Hawaii. The value of such a work to the stock raiser, and to all cultivators of agricultural crops would be very great, and we hope to see the matter, ere long, taken in hand. Not only the useless and harmless weed invaders of cultivated land require to be treated in such a work, but also all poisonous and otherwise injurious plants. A botanical and a popular description of each species, accompanied by a good illustration, and also an account of the best means of eradicating it, would form a most valuable addition to local agricultural literature. Much excellent work, of this nature, has lately appeared in the agricultural periodical literature of the British Colonies and in some cases admirable colored illustrations have accompanied the descriptions of the important specimens.

Many of the exotic weed plants of the Hawaiian Islands are well known and need no introduction to the agriculturists. However, it would come within the province of such a work as the one suggested to endeavor to attract attention to the possible economic value of plants which are now merely regarded as cumberers of the ground. Of such plants the *kolu* (mimosa) deserves especial mention. As is well known the blossoms of this plant afford a most valuable perfume, and in southern France a large population is engaged in the cultivation of the plant. In Hawaii, where the mimosa grows so luxuriantly, there should be a future before the grower of this plant for perfumery purposes, if the difficulties of the labor of gathering the blossoms could be successfully met. Probably a solution of the difficulty could be by the employment of children. No more healthful and picturesque an industry could be established near Honolulu than that of the cultivation of mimosa for perfumery purposes.

Among plants offering similar obstruction to the agriculturist are the guava and the lantana, the methods of eradication of which are similar to those required in the case of mimosa. In the case of the lantana the possibilities of discovering an economic use are slight, although it has been suggested that tannin may be extracted from it, and we have also seen it reported that its blossoms afford a perfumery useful for soap. The guava, how-

ever, offers greater promise, and the systematic cultivation of this fruit both for the manufacture of preserves, and also for the development of a dessert fruit, are worthy of trial.

The prickly-pear in these islands has not generally proved a very bad pest, although the experience of other countries has not been so fortunate. In Europe and northern Africa several delicious edible varieties of prickly-pear are grown, and would without doubt succeed well in Hawaii.

One of the most objectionable weeds near Honolulu is that appropriately designated the "stink-vine" (*mailepilau*). This unwelcome intruder has taken almost complete possession of some spots favorable to its growth, where it fills the air with its unpleasant odor and is effectually choking out both native and introduced plants. The sight of a graceful pandanus struggling beneath masses of this repulsive vine is one of the most regrettable of the silent tragedies of plant life. It is to be hoped that some way will soon be found to exterminate this undesirable weed.

There are also in the Hawaiian Islands many obnoxious introduced plants of less notoriety than those named, but whose control is none the less desirable. In many cases if the danger of allowing such weeds to spread were made known by the publication of suitable information, the pest could be often controlled and prevented from being spread wide cast through the islands. Among such useless, and often actively harmful plants, may be included several persistent grasses and other smaller weeds, which unless kept in check are likely to prove a menace to pastures and cultivated land. Many such useless weeds infest the house lot and are even ready to take possession of lawns and flower beds whenever, through lack of knowledge or other reason, they are not continually checked.

The unwelcome species are not confined to introduced offenders, but some native plants should be placed under the ban or at least looked upon with suspicion. Many a plant which in its native habitat finds a proper place in the economy of the flora, may possess inherent qualities, which when allowed to develop under artificial surroundings may develop extraordinary powers of inflicting harm upon cultivated crops. In this respect it is perhaps well to call attention to a native plant which has till now remained unheeded, except by the few who have assisted its spread from an appreciation of its fancied ornamental appearance. We refer to the *kaunaoa*, an aerial vine made use of by the natives for yellow leis. The propensity of this creeper to grow on many hosts has assisted its distribution and colonies of it are often established by the natives in convenient localities. The *kaunaoa* is evidently closely related to the European pest "Dodder" which has played havoc with many cultivated crops in Germany and England. The latter plant is a true parasite, apparently a degenerate convolvulus, devoid of leaves. It has the faculty of penetrating the bark of many plants upon which it derives nour-

ishment by suctorial rootlets embedded in the bark of the host. The general habit of the kaunaoa mark it as a plant which should be encouraged to spread beyond its native confines, as little as possible.

In a complete compilation of obnoxious weeds a list of those plants whose structure harbors mosquito larvae, and whose cultivation is therefore undesirable near habitations, would also find an appropriate place.

THE FARMERS' INSTITUTE OF THE TERRITORY OF HAWAII.

Honolulu, Hawaii, December 17, 1907.

Editor, Hawaiian Forester:

The second annual agricultural exhibit under the auspices of the Farmers' Institute of Hawaii, and in coöperation with the Hawaiian Poultry Association's third annual exhibition, will be held in the Drill Shed, Honolulu, January 8-11, 1908.

The Farmers' Institute invites the hearty coöperation of all agriculturists and amateur gardeners of the Territory to make this second exhibition the best possible representation of the varied and bountiful resources of our soils and climate.

It is the aim of the Institute to make this agricultural exhibition representative of all the Islands and as diversified as possible.

Entries covering a wide range of products of the farm, orchard and garden have been provided for, and in recognition of the best display, a first and second prize, consisting of a blue and a red ribbon, respectively, will be awarded in each class of exhibits.

To further encourage exhibits from the other Islands, the Inter-Island Steam Navigation Company has generously offered to transport, free of charge, all exhibits shipped from points touched by their steamers. Upon arrival in Honolulu, such exhibits will be cared for by the Farmers' Institute. No entrance fee will be charged.

A detailed list of exhibits will be published within a few days. Communications should be addressed to

F. G. KRAUSS,
Secretary, Farmers' Institute, Honolulu.

PROGRESS OF FORESTRY IN HAWAII DURING 1907.

PAPER READ BEFORE THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

BY RALPH S. HOSMER,

Superintendent of Forestry of the Territory of Hawaii.

(November 13, 1907.)

Members of the Hawaiian Sugar Planters' Association:

Gentlemen: Following the precedent of former years, the chairman of your Committee on Forestry has again asked me to appear before the Association with a statement of the progress of forestry in the Territory during the past year. This I am glad to do, for the Hawaiian Sugar Planters' Association is one of the forces that is always to be counted on for active coöperation and support in the furtherance of forestry in the islands.

Forest work in Hawaii naturally divides itself into that carried on by the Territorial Division of Forestry and that done by private individuals and corporations. It may be treated accordingly.

FOREST RESERVES.

In the activities of the Division of Forestry the creation of forest reserves continues to hold chief place. Since the last meeting of this Association, three additional forest reserves have been declared, as follows: Lualualei on Oahu, Hana on Maui, and Na Pali-Kona on Kauai. The area of government land in these reserves is, respectively, 3,743, 13,767, and 40,650 acres, or a total of 58,160 acres. Within the boundaries of the Hana Forest Reserve are also 1,058 acres of privately owned land; within the Na Pali Forest Reserve 19,890 acres are in private ownership.

Other forest reserve projects now awaiting final action are the proposed West Maui Forest Reserve, containing a total area of 44,440 acres; the proposed Makawao Forest Reserve, also on Maui, 1,796 acres; and a section of the land of Honouliuli, Oahu, which will make with the areas already set apart on that range a good sized forest reserve on the Waianae Hills. Within a short time the boundary of the proposed Kohala Mountain Forest Reserve will be located on the ground, when this project can be acted upon.

Each of the forest reserves set apart during the past year is made with the idea of protecting the forest on the water-

sheds of streams important for irrigation, power development or other use. They are all essentially "protection forests" and as such it is desirable that the forest within their boundaries be kept strictly intact. The same statement holds true of the projected reserves on Maui and on the Kohala Mountain.

Change in the Forest Reserve Law.

At the last session of the Legislature, during the spring of 1907, a very important step in forest work was taken when the forest reserve law was so amended as to permit the Governor to set apart government land within the forest reserve boundaries, whether it is under lease or not. It is specifically provided that such action shall be subject to existing leases, but being set apart, at the expiration of the lease the land automatically comes into the class of land definitely reserved. The advantage of this is that it leaves no uncertainty as to what the government's policy will be in regard to given forest tracts. It also makes for permanency in the management of the various reserves.

FOREST UTILIZATION.

During the last year and especially during the last two months much interest has been awakened in the subject of the utilization of the Hawaiian forests for Koa lumber and Ohia Lehua railroad ties. This development of what promises to be an additional industry to the Territory deserves special comment for it involves questions of forest policy of vital importance.

Two Classes of Forest.

It is perhaps pertinent at this juncture to consider certain essential differences between the two main classes of forest in Hawaii. As I have pointed out in previous reports, the primary importance of the Hawaiian forests lies in their value as a protective cover on the watersheds of the streams of the Territory, of which the water is needed for irrigation, power development, domestic supply and other uses. In practically all of the forest reserves on the windward side of the islands, or in districts where the reserve protects permanently running streams or springs, the forest cover should be kept intact, in order that the forest as a whole, including both the trees of the main stand and the shrubs and smaller plants of the undergrowth, may exercise to the full their function of retarding the run-off and thus helping to maintain a moderately even flow in the streams. For this reason I reported adversely, last July, on a proposition to lumber the forest on the government

land of Piilhonua, Hawaii, in the Hilo Forest Reserve, on the ground that the opening up of the forest on that land would be detrimental to the favorable conditions existing on the drainage basin of one of the most valuable streams in the Territory—the Wailuku River.

The Commercial Forest.

On the leeward side of the islands, however, and in districts where because of topography and other factors there is no permanently running water, a quite different condition obtains. Here the commercial value of the forest takes first place in an estimate of its worth. Especially is this true of Hawaii and particularly of the Kona District, although it also holds good of sections of Kau and Puna. It is hardly necessary to remark that in the utilization of the forests in these districts the work ought to be done with due regard to the future. Except in localities where it is obvious that the land can be used to better advantage for other purposes than growing trees, the indication is for methods of conservative lumbering, whereby the mature trees of merchantable value now on the land may be removed in such a way that the forest will be left in good producing condition, which will in time permit the harvesting of other crops. Fortunately for the Territory the owners of the large private estates are alive to the importance of handling their forest properties in accordance with the methods of practical forestry, so that there is every reason to expect that the major part of the lumbering done will be carried on in a systematic and carefully planned manner. This being the case the advent of this new industry is to be welcomed as a development of much importance to the Territory.

TREE PLANTING ON WASTE LANDS.

Outside of the work in connection with forest reserves the energies of the Division of Forestry during the past year have been mainly directed (1) toward coöperative assistance to individuals and corporations desiring to plant trees and (2) to the introduction of exotic trees and shrubs of value to the Territory. Under its offer of assistance to private owners the Division of Forestry stands ready at all times to prepare planting plans for persons desiring to establish groves or plantations of forest trees, or who wish to do other forest work. This matter should be of peculiar interest to the members of this Association for there is hardly a sugar plantation on the islands but that has some areas of waste land that might well be devoted to the growing of trees. With the increasing scarcity of fuel that is being felt in many districts

and with the steady rise in price of the lumber needed for various uses on the plantation, it needs no argument to show the advantage of a local supply, even though it meets only a part of the demand.

A number of the sugar plantations on each of the islands have undertaken and are carrying on tree planting work, but there are many areas of waste land that still wait to be made productive. The offer of the Division of Forestry to assist in this work, is a standing one; the members of the staff are ready at all times to undertake the work.

PLANT INTRODUCTION.

In the introduction of exotic plants the past year has seen marked progress. Through the exchange of Hawaiian grown seed of native and introduced plants, seed of many valuable trees new to the islands has been received. This seed is being started at the Government Nursery. In due course the trees resulting will be planted out in suitable situations where they can be carefully watched; those that are found to be of value will eventually be propagated and generally distributed. The results of this work can but be of value to the Territory.

Another item of considerable interest in this connection is the inauguration of systematic experiments with temperate zone trees—pines, spruces and firs—on the higher slopes of Mauna Kea and Haleakala. This work is done with the coöperation of the Federal Forest Service, from whose appropriation for this fiscal year an allotment of two thousand dollars has been made for this purpose.

RUBBER.

The rubber industry of the Territory continues to develop with every sign of promise. It is as yet too soon to regard it as fully established but everything points to the time when rubber will take its regular place as one of the important "allied industries." Perhaps the most notable event of the year in connection with rubber was the successful convention held at Nahiku in October, 1907,—“the first rubber convention ever held on American soil” as the papers had it—when was organized the Hawaiian Rubber Growers' Association, with the object of providing an organization which it is hoped will benefit the rubber industry in somewhat the same way that the Hawaiian Sugar Planters' Association has benefitted sugar.

To sum up: The past year may well be considered one of progress in forestry in Hawaii, for while the things actually accomplished may not in themselves be striking they nevertheless play an important part as units in the building up of the structure on which we are all at work, the development of the general prosperity of the Territory.

AN IMPORTANT LEGAL OPINION.

At the instance of the Board of Agriculture and Forestry, the Attorney General of the Territory of Hawaii, Honorable C. R. Hemenway, has recently handed down an opinion which, because of its far-reaching effects, is of the utmost importance to the Board, besides being a matter of much moment in the forest history of Hawaii.

The question at issue was whether or not the Board had the right to sell products from forest reserves and to use the realizations so received as a special fund for other forest work, it having been claimed by some that the law as it stands was unconstitutional in this section.

Based on an exhaustive statement of the various conditions entering the case, the Attorney General rules that the Board may properly dispose of forest products and use the money accruing therefrom for the purposes for which it is organized.

This matter is of fundamental importance to the Territory's forest work, and of such general interest that Attorney General Hemenway's opinion is here reproduced in full, as follows:

EXECUTIVE BUILDING.

OFFICE OF THE ATTORNEY GENERAL.

Honolulu, Hawaii, November 19, 1907.

OPINION NO. 42.

Honorable E. A. Mott-Smith,
Secretary of Hawaii,
Honolulu, T. H.

DEAR SIR:

In response to your verbal request for the opinion of this Department, as to whether the Board of Agriculture and Forestry has power to sell wood to be cut upon forest reserves, and other products of such forest reserves, and whether the realizations from such sales can properly be expended for the replanting of portions of such forest reserves, we would advise you as follows:

For a proper understanding of the question involved, it seems necessary to review the various statutes relating to forestry which have from time to time been in force in Hawaii.

The first legislature enactment on the subject of forestry was "An Act for the Protection and Preservation of Woods and Forests," Ch. 30 S. L. 1876, (Appendix, R. L. P. 1281).

This act, by Section 1, authorized the Minister of the Interior

"to set apart and cause to be protected from damage such woods and forest lands, the property of the government, as may in his opinion be best suited for the protection of water sources, and the supply of timber and fruit trees, cabinet woods and valuable shrubbery." He was also authorized, by Section 3, "to secure from the Commissioners of Crown Lands, by lease or otherwise, such woods and lands being the property of the Crown, as may be suitable for carrying out the purposes set forth in this Act." The same officer was further given authority, by Section 2, to appoint a superintendent of woods and forests whose duty it was to carry out such rules and regulations as might be established for the protection of "Reserved woods and forest lands." While the power to make such rules and regulations is not expressly given, it is one which is necessarily implied from the provisions quoted. Under this act of the legislature, therefore, certain portions of the public domain might be set apart for special purposes and became then a separate class of land to be utilized in one way only.

By the "Act to Establish a Bureau of Agriculture and Forestry," Ch. 81, S. L. 1892 (Appendix R. L. P. 1285) the execution of the law above referred to was made one of the duties of such Bureau, which consisted of the Minister of the Interior, as President ex-officio, and four other persons appointed by him with the approval of the Cabinet. Whether the Bureau thereby became authorized to set apart government lands for forest reservation is doubtful, but such Bureau clearly was charged with the duty of caring for such reservations when made. The Minister of the Interior having the care and control of government lands, being given express authority to set them apart for forest reservations, and being ex-officio President of the Bureau of Agriculture and Forestry, it may be argued that the legislature saw no need of expressly transferring the power to make such reservations inasmuch as no conflict of authority was likely to occur.

Section 9 of said Land Act "to make, alter and revoke rules and regulations * * * for the protection of forests and reservations for forest growth."

The Land Act did not expressly repeal or amend the provisions of the "Act to Establish a Bureau of Agriculture and Forestry," Ch. 81, S. L. 1892 (Appendix R. L. P. 1285), referred to above. On the contrary it must be studied in the light of such act, and construed, if possible so as not to conflict with the provisions of such. The question arises, therefore, as to what effect the Land Act had on the previous provisions of law.

It will be noted that forest reservations heretofore made remained under the control of the Minister of the Interior, who also was to take charge of all reservations of public lands thereafter made for "public purposes." It will also be noted that the Commissioners of Public Lands were placed in charge of all public lands, except certain designated classes, and that when lands were set apart by them "for public purposes" such lands thereupon

passed under the control of the Minister of the Interior. Express power to make forest reservations was not given the Commissioners, and this power, if given, must be implied from the provisions of Section 2 that "all land hereafter reserved by the Commissioners for public purposes, shall thereupon at once pass under the control and management of the Minister of the Interior;" and from the power given in Section 9 to make rules and regulations respecting "forests and reservations for forest growth." It might, therefore, seem that the power theretofore existing in the Minister of the Interior to set apart forest reservations was by the Land Act transferred to and lodged in the Commissioners of Public Lands, and that such reservations when made by such act immediately passed out of the control of said Commissioners and into the control of said Minister, or therefore into the control of the Bureau of Agriculture and Forestry of which said Minister was ex-officio President. But it must not be forgotten that the Minister was by law one of the Commissioners of Public Lands so that again it may be reasonably concluded that the Legislature anticipated no conflict of authority and therefore felt that there was no need to more clearly define the limits of the powers to be exercised by the Minister of the Interior on the one hand and the Commissioner of Public Lands on the other.

It must also be borne in mind that the purpose of the Land Act differs widely from that of the Forestry Laws. The former was designed chiefly with the object in view of settling the land and causing it to produce immediate money revenue, while the latter was intended to conserve the water and timber supply for the purpose not of immediate gain, but of future and continuous benefit to the entire country.

That the general policy of making such reservations was approved and intended to be continued in force is shown by the fact that the existing law as to forestry was not specifically amended or repealed by the Land Act.

Such being the case, and in order to give effect to both provisions of law, which should be construed, if possible, so that each may stand, it may be fairly held that the power of the Minister and Bureau to make forest reservations was continued and that the Commissioners were intended to have authority to make rules and regulations only as to forest lands not formally "reserved," while the Bureau retained authority to make such rules for actual forest reservations under its control. By such a construction the spirit and intent of all legislation on the subject would be conserved.

It therefore, would appear that the true intent of the various acts under consideration was that such lands should be set apart for a forest reservation as the Minister of the Interior, under the direction of the Bureau, should consider necessary for such purpose, and that such land should thereupon pass to the exclusive control of such Minister subject as to management to the advice

and supervisory care of the Bureau of Agriculture and Forestry.

If such is the proper construction of these enactments, then at the time the Organic Act went into effect, the Minister of the Interior still possessed the power to effect a reservation of portion of the public domain for forestry purposes, which when so set apart passed into the control of the Bureau of Agriculture and Forestry.

By Section 73 of the Organic Act the land laws of Hawaii were continued in force until Congress should otherwise provide, the only change being that one officer performs the duties and exercises the powers formerly performed and exercised by the Commissioners. By Section 74 of said Organic Act the laws relating to Agriculture and Forestry also remained the same, but subject to modification both by Congress and the local legislature. By Section 75 of said Act the Superintendent of Public Works was given the powers and duties of the former Minister of the Interior with regard, among other things, to "other grounds and lands now under the control and management of the Minister of the Interior," and subject to change by the Legislature of Hawaii.

Just what the "land laws" of Hawaii were, as the term is used by Congress, is not altogether clear. Beyond question the Commissioner of Public Lands has the power and is charged with the duties of the former Commissioners of Public Lands, one of whom was the Minister of the Interior. It is also clear that the Superintendent of Public Works was given the custody and control of lands set apart for various public purposes and formerly in charge of the Minister of the Interior. A distinction clearly exists as to the general powers and duties of these officers in that the Congress alone may modify those of the Commissioner of Public Lands, while both Congress and the local legislature may change those of the Superintendent of Public Works. But has the Commissioner of Public Lands the sole or any authority to set apart and reserve portions of the public domain for forestry purposes or is that power one which Congress intended to and did leave to some other officer?

If the Commissioner has such authority then Chapter 14, S. L. 1903 (Ch. 28 R. L.), creating the Board of Agriculture and Forestry is valueless to the extent that it attempts to authorize the Governor to make such reservations; if, however, some other officer had such authority, then the provisions of said Chapter are valid. If the reasoning above is sound, and the Commissioner has no such power under the "Land Act," then his power, if any, must be found in the Organic Act.

From the fact that the laws relating to agriculture and forestry were continued in force until modified with the single change that a single commissioner should perform the duties formally required of the Bureau, it would appear that Congress realized the necessity of making the care and protection of forest reservations the special duty of some officer, or set of officers, and approved of

the existing system. If so, then Congress certainly intended to provide for the creation of forest reservations by the act of some authorized officer. Section 1 of Chapter 30, S. L. 1876, which authorized the Minister of the Interior or the Bureau of Agriculture and Forestry to make such reservations was still a part of the statute law, but the office of Minister of the Interior ceased, and the powers exercised by him were divided among several officers, to-wit, the attorney general, treasurer, superintendent of public works, and commissioner of public lands, but an examination of the provisions of the Organic Act as to the powers and duties of these officers shows that no one of them succeeded to this particular power, and it is necessary to look farther or to conclude that Congress failed of its purpose.

By Section 68 of the Organic Act, the Governor was given "all the powers and duties, which by the law of Hawaii, are conferred upon or required of * * * any minister of the Republic of Hawaii (acting alone or in connection with any other officer or person or body) * * * and not inconsistent with the Constitution and laws of the United States." Under this provision it may be fairly considered that the power to create forest reservations was transferred by Congress to the Governor. By such holding full effect is given to the intent of Congress in continuing in force the local laws relating to agriculture and forestry and the full purpose of such laws could be carried out. It is our opinion then, that after the passage of the Organic Act the Governor had power to withdraw lands from the control of the Land Commissioner for forestry purposes, and that such lands so reserved then passed under the control of the Bureau of Agriculture and Forestry. This power is not inconsistent with the powers of the Commissioner of Public Lands, but is entirely separate and distinct therefrom. The Commissioner was not given nor intended to have all powers relative to the use and control of all public lands, but only those formerly exercised by the Commissioners of Public Lands, and the Land Act as pointed out above gave certain distinct powers exercised by the former Minister of the Interior, to the Superintendent of Public Works.

This was the status of the law until the passage of Chapter 44, S. L. 1903 (Ch. 28 R. L.), creating the Board of Agriculture and Forestry, which is the statute under which forest reservations are now handled. It is clear that the Legislature was given power by Section 74 of the Organic Act to enact this statute. The question, therefore, comes down to a construction of this statute and it must be determined whether by it the Board has authority to manage and control all forest reservations with power to sell their produce or whether any of such powers have been transferred to the Commissioner of Public Lands.

By Section 397 R. L., the power to set aside lands as forest reservations is continued in the Governor and made subject to the approval of the Board, a public hearing being first had.

Under subdivision 6 of Section 377, R. L., and Section 379, R. L., government lands, when set apart for forest reserves are declared to be under the care, custody and control of the Board of Agriculture and Forestry, the executive officer of which also has all powers and duties vested before April 25, 1903, in the Commissioner of Agriculture and Forestry. (Sec. 373 R. L. as amended by Act 106, S. L. 1907.)

Subdivisions 7 and 8 of Section 377, R. L., which section defines the duty of the Board, read as follows:

"7 PROTECTION OF FORESTS AND WATER SUPPLY. To devise ways and means of protecting, extending, increasing, and utilizing the forests and forest reserves, more particularly for protecting and developing the springs, streams and sources of water supply, so as to increase and make such water supply available for use;

"8. SELF-SUPPORT OF FORESTS. To devise and carry into operation, ways and means by which forests and forest reservations can, with due regard to the main objects in this chapter set forth, be made self-supporting in whole or in part"

The duty to protect, extend, increase and utilize forests and forest reserves, and to devise and carry into operation ways and means by which forests and forest reserves can be made self-supporting, carries with it such power as is necessary to properly perform such duty. If in the due performance of the duty thus laid on the Board of Agriculture and Forestry it becomes necessary for the Board to cut and remove a portion of the timber in the forest reserve, the Board would have power to do so; and in order to carry out the duty of devising ways and means of making forests and forest reserves self-supporting, the Board would have power to sell timber so cut. The exercise in any case of a power by the Board must be limited by the necessity for its use, in order to perform properly a duty laid upon it, and only the power necessary to perform such duty is given it. While the power of the Board to cut and remove wood upon forest reserves is an implied power only, yet the provisions of Section 385 of the Revised Laws seem to indicate that the legislature intended to authorize the Board to exercise just such power whenever it was necessary for the protection, increase, or extension of forests and forest reserves. That section reads as follows:

"Sec. 385. INCOME FROM FOREST RESERVES. In case any money shall accrue from any forest reserve, or the products thereof, the same shall be deposited in the treasury as a special fund for the preservation, extension and utilization of forests and available for use under this chapter, subject to withdrawal and use in the same manner as moneys appropriated by the legislature."

By this section it seems clear that the purpose of the legislature was to permit the expenditure of moneys realized from the products of the forests, such as timber, for the purpose of general improvement of the forest lands set apart as reservations, and unless the legislature contemplated that moneys would be realized by such sales, the presence of this section in the law would be valueless.

The conclusion drawn is that the reservation of forest lands may properly be done by the Governor; that when so done the lands come under the control of the Board of Agriculture and Forestry, passing out of the hands of the Commissioner of Public Lands, that said Board is empowered to dispose of such products of the forests as are necessarily taken therefrom to carry out the purposes of this act and to enable a proper performance of the general duty to protect, extend, increase and utilize the forest with a view to rendering the same self-supporting in whole or in part; and that the proceeds of a sale of such products may be deposited in the Treasury as a special fund and used by the Board for the purposes set out in Section 385 R. L.

Very truly yours,

(Signed) C. R. HEMENWAY,
Attorney General.

NEW PUBLICATIONS.

FARMERS' BULLETIN NO. 307.

Roselle: Its Culture and Uses. By P. J. Wester, Special Agent.
Pp. 16, figs. 6.

History, geographical distribution, botanical characteristics, varieties, cultivation, uses, etc., of the roselle plant, with a statement of its composition, its fungous diseases and insect enemies.

FARMERS' BULLETIN NO. 309.

Experiment Station Work, XLIII, Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32.

Contents: Ice for household—Culture and varieties of root crops—Cowpeas and soy beans—Silage from frosted corn—Cooperation in marketing crops—Incubation of eggs—Causes of death of young chicks—Snow for poultry—Eradication of cattle ticks—Bacteria in cream.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

ROUTINE REPORTS.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

November 20, 1907.

Gentlemen:

I have the honor to submit the following report for the period from October 30th, 1907, to date:

My own time during this period has been mainly occupied in the preparation of reports on several matters referred to me by the Committee on Forestry and in the regular routine work of the Division of Forestry.

On November 13th, at the request of the Secretary and the Chairman of the Committee on Forestry of that organization, I read a paper on "the progress of forestry in Hawaii during the past year," before the Hawaiian Sugar Planters' Association. At the same meeting, Mr. L. A. Thurston, the Chairman of the Committee on Forestry, presented an exceedingly able statement that set forth in a comprehensive way how the diminishing timber supply on the American mainland directly affects the forest question in Hawaii and how, consequently, it is essential to the continued well being of these islands that a rational forest policy be adhered to. Mr. Thurston's address was published in full in the Advertiser of November 15th, 1907. It will repay careful reading and thoughtful consideration.

By proclamation of Governor Frear, Arbor Day was this year observed on Friday, November 15. As usual the celebration of the day was principally by the schools. In Mr. Haughs' report will be found a statement of the number of trees sent out from the Government Nursery for Arbor Day planting.

Since October 30 the library room of the Board has been used for evening meetings, as follows:

Honolulu Improvement Advisory Board, November 5.

Hawaiian Poultry Association, November 12.

" " " " 18.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Notes from the report of the Forest Nurseryman.

ARBOR DAY.

The plants sent out for Arbor Day planting, with number of schools by islands, is as follows:

Islands.	Schools.	Plants.
Oahu	10	133
Hawaii	7	280
Kauai	2	42
Maui	5	180
Molokai	4	889
	<hr/> 28	<hr/> 1524

NURSERY.

Three thousand seeds of Para rubber (*Hevea brasiliensis*) are being propagated at the request of Commissioner Giffard. The seed was received in first class condition and is sprouting splendidly.

The five thousand seeds belonging to the Castle Estate are also growing vigorously and will require to be taken to their destination and transplanted in the course of a week or two.

The work of improving the Nursery grounds is still progressing. The trees are being pruned with the object of making them more symmetrical and allowing more light to the grass.

COLLECTING AND DISTRIBUTION OF SEEDS.

Two packages of seed of the Grass tree (*Xanthorrhoea hastilis*) were received from Mrs. Hans Isenberg, Lihue, Kauai.

By exchange:

6 packages from Imperial Biological Institute, Amani, Port Tonga, German East Africa.

6 packages from Acclimatization Society Gardens, Brisbane, Queensland.

26 packages from Harvard Experiment Station, Soledad, Cienfuegos, Cuba.

The collecting of island grown seed has been continued; a large variety is always kept in stock.

THE RUBBER CONVENTION.

By an inadvertence, in the report of the Rubber Convention at Nahiku, Maui, which appeared in the October number of the Forester, the speech of Governor Frear was attributed to Mr. Lindsay. We apologize to all concerned for this transposition of names.

OUR NATURAL RESOURCES.

In a circular letter addressed by President Roosevelt to the Governors of the States, the importance of conserving for future generations the natural resources of the nation are urged at some length. The subject is one which no thoughtful man can view with unconcern, and is so important that we print the letter al-luded to, verbatim:

The White House,
Washington, November 11, 1907.

My Dear Governor: The natural resources of the territory of the United States were, at the time of settlement, richer, more varied, and more available than those of any other equal area on the surface of the earth. The development of these resources has given us, for more than a century, a rate of increase in population and wealth undreamed of by the men who founded our government and without parallel in history. It is obvious that the prosperity which we now enjoy rests directly upon these resources. It is equally obvious that the vigor and success which we desire and foresee for this nation in the future must have this as its ultimate material basis.

In view of these evident facts it seems to me time for the country to take account of its natural resources, and to inquire how long they are likely to last. We are prosperous now; we should not forget that it will be just as important to our descendants to be prosperous in their time as it is to us to be prosperous in our time.

Recently I expressed opinion that there is no other question now before the nation of equal gravity with the question of the conservation of our natural resources; and I added that it is the plain duty of those of us who, for the moment, are responsible, to make inventory of the natural resources which have been handed down to us, to forecast, as well as we may, the needs of the future, and so to handle the great resources of our prosperity as not to destroy in advance all hope of the prosperity of our descendants.

It is evident that the abundant natural resources on which the welfare of this nation rests are becoming depleted and in not a few cases are already exhausted. This is true of all portions of the United States; it is especially true of the longer settled communities of the East. The gravity of the situation must, I believe, appeal with special force to the Governors of the States because of their close relations to the people and their responsibility for the welfare of their communities. I have therefore decided, in accordance with the suggestion of the Inland Waterways Commission, to ask the Governors of the States and Territories to meet at the White House on May 13, 14, and 15, to confer with the President and with each other upon the conservation of natural resources.

It gives me great pleasure to invite you to take part in this conference. I should be glad to have you select three citizens to accompany you and to attend the conference as your assistants or advisors. I shall also invite the Senators and Representatives of the Sixtieth Congress to be present at the sessions so far as their duties will permit.

The matters to be considered at this conference are not confined to any region or group of States, but are of vital concern to the Nation as a whole and to all the people. These subjects include the use and conservation of the Mineral Resources, Resources of the Land, and the Resources of the Waters, in every part of our territory.

In order to open discussion I shall invite a few recognized authorities to present brief descriptions of actual facts and conditions, without argument, leaving the conference to deal with each topic as it may elect. The

members of the Inland Waterways Commission will be present in order to share with me the benefit of information and suggestion, and, if desired, to set forth their provisional plans and conclusions.

Facts, which I can not gainsay, force me to believe that the conservation of our natural resources is the most weighty question now before the people of the United States. If this is so, the proposed conference, which is the first of its kind, will be among the most important gatherings in our history in its effect upon the welfare of all the people.

I earnestly hope, my dear Governor, that you will find it possible to be present.

Sincerely yours,

(Signed.) THEODORE ROOSEVELT.

Hon. Walter F. Frear,
Governor of Hawaii,
Honolulu, Hawaii.

ARBOR DAY.

PROCLAMATION OF THE PRESIDENT TO THE SCHOOL CHILDREN OF THE UNITED STATES.

To the School Children of the United States:

Arbor Day (which means simply "Tree Day") is now observed in every State in our Union—and mainly in the schools. At various times from January to December, but chiefly in this month of April, you give a day or part of a day to special exercises and perhaps to actual tree planting, in recognition of the importance of trees to us as a nation, and of what they yield in adornment, comfort, and useful products to the communities in which you live.

It is well that you should celebrate you Arbor Day thoughtfully, for within your lifetime the Nation's need of trees will become serious. We of an older generation can get along with what we have, though with growing hardship; but in your full manhood and womanhood you will want what nature so bountifully supplied and man so thoughtlessly destroyed; and because of that want you will reproach us, not for what we have used, but for what we have wasted.

For the nation as for the man or woman and the boy or girl, the road to success is the right use of what we have and the improvement of present opportunity. If you neglect to prepare yourselves now for the duties and responsibilities which will fall upon you later, if you do not learn the things which you will need to know when your school days are over, you will suffer the consequences. So any nation which in its youth lives only for the day, reaps without sowing, and consumes without husbanding must expect the penalty of the prodigal, whose labor could with difficulty find him the bare means of life.

A people without children would face a hopeless future; a country without trees is almost as hopeless; forests which are so used that they can not renew themselves will soon vanish, and with them all their benefits. A true forest is not merely a storehouse full of wood, but, as it were, a factory of wood, and at the same time a reservoir of water. When you help to preserve our forests or to plant new ones you are acting the part of good citizens. The value of forestry deserves, therefore, to be taught in the schools, which aim to make good citizens of you. If your Arbor Day exercises help you to realize what benefits each one of you receives from the forests, and how by your assistance these benefits may continue, they will serve a good end.

THEODORE ROOSEVELT.

The White House, April 15, 1907.

THE DISAPPEARING WHITE PINE.

The position which the United States has held as a lumber-producing nation has, perhaps, been due more to white pine than to any other wood. The timber of this valuable tree which has played a most important part in the material development of the nation is fast disappearing and now it is as costly as the finest American hardwoods.

Rev. Edward Everett Hale, the chaplain of the Senate, who has always taken an interest in forestry, deplors the passing of white pine as our foremost wood, and tells how in his own lifetime he has seen the day when "the masts of every vessel that sailed the Seven Seas were made from New England grown pine; while today very little white pine is cut in New England big enough to furnish a good-sized spar." He tells also, to illustrate the increasing cost of the wood, that he ordered a set of book shelves on which the cabinet-maker made a price, and then asked whether they should be of mahogany or white pine.

The white pine production has shifted from New England to the Lake States, and Michigan was the leading lumber-producing State for twenty years, from 1870 to 1890, with a supremacy based on white pine. In these two decades the cut was 160 billions of board feet, valued, at the point of production, at not less than two billion of dollars, or nearly half as much as the value derived from all the gold fields of California from their discovery in the late forties until the present. The rich forests of Michigan were once thought inexhaustible and lumbering continued in a most reckless manner, for years. Suddenly the people awoke to the fact that the thoughtless destruction of the trees had thrown 6,000,000 of acres on the delinquent tax list. These white pine barrens point to the terrible penalty of wasting the forest resources which should have been the heritage of all future generations.

An idea of the increasing scarcity of white pine timber is given by the New York F. O. B. quotations, on a basis of carload lots. "Uppers" of the best grade, cost \$97 to \$114 a thousand board feet, and the "selects" or next lower grade cost \$79.50 to \$99.50. Men who are not yet middle-aged remember the time when these grades could be purchased at \$15 to \$25 a thousand feet. The present quotations on quartered white oak, which are \$75 to \$80, offer another basis of comparison which indicates the condition of the market for white pine.

The best stands of this timber now in this country are in scattered sections in Minnesota, New England, and parts of Idaho. The species in Idaho is sometimes called silver pine. Some of the country's best white pine is found on the Indian reservations in Minnesota and Wisconsin, and scattered stands are found in the States of Wyoming, Montana, Colorado, and one or two other States. At the present rate of cutting the tree will soon be practically a thing of the past. The small stands in the National forests are inconsiderable, but they will be managed with the greatest conservatism by the Government through the Forest Service, and through this method and practice of reforestation it may be hoped that the fine old tree will furnish timber for other generations.

ANOTHER NEW INDUSTRY.

The installation of two modern lime kilns at Iwilei by the Waianae Lime Company, affords another noteworthy example in the movement which has been taking place in Hawaii during the the last few years of making the islands independent of the out-

side world for the supply of many important commodities. The annual importations of lime are valued at about an eighth of a million dollars, and if the quality of the new company's product continues to be equal to that of its first samples, there is little doubt that the local firm will be called upon to supply most of the Hawaiian market.

The new kilns at Iwilei are thoroughly modern, and although they bear little resemblance to the old type of apparatus, the process involved in the manufacture of lime is identical with that carried on for countless ages. Each kiln consists in brief of a large vertical steel cylinder, thickly lined with fire brick and having an inside diameter of four feet six inches. The fuel used is oil, and while the calcining process is continued the lime is removed from below and fresh supplies of limestone added to the top of the kiln. The latter is constructed so as to be kept in operation day and night, thus obviating the former method of allowing time for cooling. The lime is collected upon a cement floor, where after cooling, it is packed into barrels and is then ready for shipment. The kilns have an estimated capacity of one hundred tons each per day of twenty-four hours.

The limestone used is quarried at Waianae, from whence it is brought by rail direct to the kilns. The company has also established a cooper shop where it is constructing its own barrels.

THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

APPOINTMENT OF ACTING DEAN.

Mr. Willis T. Pope, of the science department of the Honolulu Normal School, has been appointed Acting Dean of the College of Agriculture and Mechanic Arts of the Territory, in the place of the late Mr. J. E. Roadhouse, whose decease was recently announced. The organization of the new institution will be proceeded with immediately on the new High School site near Thomas Square. As soon as the development of the College permits, it will remove to its permanent quarters in Manoa Valley, adjoining the Mid-Pacific Institute, where a tract of over thirty acres of excellent land is reserved for it.

The task of establishing a College of Agriculture and Mechanic Arts in its numerous departments will be no light one. In the selection of Mr. Pope for this work, however, the Regents have acquired one who, besides the ordinary requisites of education and experience, has knowledge of tropical and local agriculture, and possesses the confidence of the community.

Mr. Pope was born in Decatur, Illinois, in 1873. He is a graduate of Kansas Agricultural College, where he specialized in dairy work and in horticulture. During his collegiate course he was also an assistant at the United States Agricultural Station at Manhattan. After holding important agricultural positions in which he acquired valuable knowledge in the practical cultivation and marketing of fruit, he was appointed to the chair of Horticulture at the National Farm School at Doylestown, near Philadelphia, in 1900. In 1902 Mr. Pope accepted the appointment at the Honolulu Normal School, which he is now relinquishing.

NOTES.

COCOA.

Cocoa importations to the United States now average over a million dollars a month in value, against an average of a quarter of that amount a decade ago. The practicability of growing cocoa commercially in Hawaii has not been proved, but it is one of the most promising agricultural experiments which require to be demonstrated. The cultivation of cocoa is a very remunerative asset to many countries similarly situated as Hawaii and is one which in every way is worthy of establishing in the islands.

STRIPPING OF CANE.

The custom of stripping cane which has been extensively followed for many years is one of questioned value. Mr. H. P. Baldwin recently recommended that the Experiment Station of the Hawaiian Sugar Planters' Association conduct an exhaustive series of experiments in order to exactly determine the effect of stripping. He believes that stripping on all plantations was a mistake and was attended by loss of sugar content. It is extraordinary that such a subject as this should still be unsettled, but many plantations still continue to spend large sums annually in stripping cane, while the opponents of the method condemn it as being not only expensive, but as depleting the cane of its sugar.

STOCK PESTS.

At a recent meeting of the Hawaiian Live Stock Breeders' Association, Mr. D. L. Van Dine read a preliminary report upon the insects affecting the cattle industry in the islands. The horn fly was mentioned as one of the worst enemies of stock in the Terri-

tory. This pest was introduced only ten years ago, but it has multiplied at an astonishing rate during this interval. There is every reason to believe that this fly will soon be controlled by its natural enemies. The bot fly was also mentioned in connection with cattle, although it has not developed its full destructive habits in this country.

Of the pests affecting sheep, the blow fly has proved very injurious, especially on Molokai, Hawaii and Oahu. In one year it had caused the death of 5,000 out of 18,000 sheep.

Among the insect pests of horses were the stable fly, the horse bot fly and the mosquitoes. The latter insect worries the animals and causes more injury than is generally appreciated.

BREAD FOR HORSE FEED.

The practice of feeding horses on bread was once very general and it still obtains in many parts of Europe. In Switzerland the bread for this purpose is made into long loaves from third-class rye flour and baked as hard as a brick. One pound of bread is given in the morning and a feed of bread at intervals when halting. Hay and oats are given as well. Animals fed in this manner are said to keep in excellent condition.

SEA-WEED MANURE.

In many countries the use of sea-weed for manure is well known. Where it occurs in sufficient quantities it may be removed from reach of the waves and allowed to rot out during the rainy season, when it will become depleted of its salt and ready for use on the soil.

COCONUTS FOR KAILUA.

One thousand coconut palms were received recently from Kauai on the W. G. Hall by The Waterhouse Company. They will be taken to Kailua, on the other side of the island, and set out on the new copra plantation.

INDEX FOR 1907.

An index for Volume IV of *The Forester* is in preparation and will be ready to accompany the January number.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 33 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 63 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906. Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906. Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906. Reprint from Third Report of the Board; 6 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

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